THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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COMPETITION IN THE ELECTRICAL INDUSTRY.

ON another page of this issue we publish a report of the annual meeting of one of our well-known electrical manufacturing and tramway contracting companies, which, like many another, has been feeling the stress of competition during the last year or two. In years gone by, when there was plenty of tramway construction work going on in all parts of the United Kingdom, the opportunities for doing profitable business were naturally greater than they have been since that class of activity fell away. The same circumstance that practically stopped permanent-way work, save in London, also naturally led to fewer orders for electric cars and equipments. Therefore, the car works with which the same company is closely associated have been experiencing a shortness of work, another reason in this connection perhaps being the municipal car-building habit which has lately called forth a ratepayers' protest in one of our big cities. We are glad, however, to note the hopeful spirit with which the chairman of the Preston electric car works views the present position, for, in considering the possibilities of improvement, he reminds us that as rolling stock requires replacement after a period of years, English Corporation Tramway Departments should soon be in the market, seeing that many of their cars have now been in service for eight or ten years. Depreciation and renewal questions, which occasionally haunt the officials responsible for the control of public electrical undertakings, are regarded with very different feelings by manufacturers who are on the look-out for business. Mr. Geo. Richardson does not think that large Corporations, as a rule, will find it convenient or advisable to build their own cars, and we trust that events will prove the correctness of his opinion or fulfil his hope, so that the slackness of work and small output, admitting of only a 2½ per cent. dividend on car-building, may soon pass away.

According to the speech of Mr. John Kerr at the meeting of Dick, Kerr & Co., Ltd., extreme competition has continued to be encountered in their department of the electrical trade, a short demand causing prices to rule low. The senseless practice of cutting prices, which we have condemned again and again in the ELECTRICAL REVIEW, has again been a difficulty that has had to be encountered, for we are told that "in many cases figures were quoted by some firms below the cost of production." It is a thousand pities that British electrical manufacturers should continue along this course. Again and again they have conferred together to see if some remedy could be found, but always, as we understand the matter, the issue of negotiations has been unsuccessful because some of the more powerful organisations preferred to "gang their ain gait." A timely letter on this topic by "Onlooker" appears in our "Correspondence" columns to-day, and

though we may not be able to see eye to eye with the writer in all that he there expresses, we should certainly welcome a new Round Table Conference among our heavier electrical manufacturers, for these seem to be the principal sufferers at the moment. The fact still remains, however, that there can be little progress made in the direction of a definite and lasting understanding if some, who ought to be in the deliberations, are unwilling to entertain the suggestion and stand icily aloof.

Having already said so on several occasions, we naturally agree with Mr. Kerr that there are signs of an approaching period of great electrical expansion both at home and abroad, which will bring plenty of work. His company already finds that the work in hand and in prospect furnishes a very encouraging outlook, and reports that reach us from different parts of the country show that other electrical works also are doing a much improved business. We believe that the improvement is going to continue, unless labour restlessness, which is becoming more and more threatening, takes the worst course. In reply to a question by a shareholder, Mr. Kerr said that the cause of the adverse electrical competition was that there was not enough work to go round. Manufacturers built new electrical factories, and extended others, when the period of slacker demand, which we did not any of us anticipate, was close at hand. Under such conditions as those, attempts to enter into understandings for prevention of price-cutting are not so likely to be successful as when more work is available. Therefore, in presence of the improved prospect, we cannot help regarding the present as a most opportune moment for a new attempt to be made to arrive at an understanding.

Electricity in Steel Manufacture.

One of the impressions carried away by everyone who attended the Buxton meetings of the Iron and Steel Institute last week, was that there are now several processes by which steel, and very good steel, can be successfully manufactured in furnaces heated by electricity. Three papers were discussed, all directly bearing upon the subject; one dealt with electric steel refining, and the other two gave an account of what has already been done towards the utilisation of electric power in the iron and steel industry.

Mr. Donald F. Campbell, who was in charge of the erection of works at Héroult, California, for the electric smelting of iron ores—the first plant of the kind to be worked successfully on a commercial basis—and who is now engaged in the design of various electric furnaces, discussed in an interesting paper (of which an abstract is given elsewhere in this issue) the general aspects of electric steel refining, and considered the possible future developments in England. He predicts that the adoption of electric refining will cause some readjustment in the steel trade. Electrically refined steel will largely replace ordinary crucible steel in the same way as it is doing in America and Germany; large crucible plants and small open-hearth furnaces engaged in the manufacture of small and intricate castings may be replaced by electric furnaces, because the high degree of fluidity and the dead melt obtained are especially advantageous; manufacturers of axles, guns and tubes will abandon the use of Swedish raw materials, and refine steel made from low-grade ores. Mr. Campbell claimed the electric furnace as an attractive load from the electrical engineer's point of view. This paper was followed by an eminently practical contribution dealing with the speed regulation of motors used for driving steelworks plant. The author, Mr. J. Elink Schuurman, of Baden, Switzerland, discussed various methods of speed regulation, and described in detail the Scherbius, the Krämer and the Déri systems, as well as their practical applications. He showed that economical speed regulation for alternating-current motors, both of large and small output, may now be obtained. He also explained that the inherently low power-factor of iron and steel works installations can be greatly improved when one or more induction motors of the plant are arranged or speed regulation according to the Scherbius or the Krämer system. The third paper was by Mr. George Chamier, of the iron and steel works at Hanyang, China, belonging to the Han-Yeh-Ping Iron and Coal Co.; he gave an historical account of the company and its plant.

In his address to the members of the Cutlers' Company of Sheffield on Tuesday, the new Master-Cutler, Alderman Senior, adversely criticised the statement made at the Buxton meeting, to the effect that in a large measure the electric furnace would do the work of the old Sheffield crucible method of melting, and would produce satisfactory tool steel, reminding his hearers that similar statements were made when the Bessemer process was invented, but, nevertheless, the Sheffield industry had increased by leaps and bounds and continued to flourish. The last remark is somewhat at variance with his admission, in the course of the same address, that Sheffield was not holding its own as it might do, and we fear that if the Master-Cutler's attitude is typical of that of his fellows, his successors will have to take a still more serious view of the position. The Bessemer process, admirable in many ways, and of immense benefit to this country in the past, has its limitations; but when allied with the electric furnace, its scope is greatly increased. Apart from this, the electric furnace is peculiarly adapted for the manufacture of steel of the very highest grades, under perfect control, and has already firmly established itself as a thoroughly practical and economical means of high-class steel production. To what extent it will be developed in the near future no one can prophesy, but judging by its rapid progress during the past few years, we cannot doubt that immense possibilities lie before it, and that old-fashioned methods, excellent in their day, must inevitably give place to the new system.

If Sheffield already feels the pinch of competition, it is certain that the time when the pressure becomes unbearable will soon be reached, unless the latest and most scientific methods of steel manufacture are adopted in order to cheapen production and improve the quality of the product. The tide of progress cannot be stayed by appeals to triumphs of the past, and we sincerely hope that the leaders of the great steel industry of Sheffield will keep an open mind, and miss no opportunity of maintaining their ancient glory, by pursuing an enlightened policy, instead of turning a deaf ear to the proposals of the electrochemists.

British Trade in Russia.

In this issue of the Electrical Review we give, on p. 593, an interesting extract from a report by the British Vice-Consul at Kharkoff with reference to the methods to be adopted to develop British engineering enterprise in Russia. Mr. Blakey, the Vice-Consul referred to, is an experienced business man and manufacturer with a wide outlook, and his remarks should carry considerable weight. With reference to this extract, H.M. Consul-General at Odessa states, in his report, that the most promising course of action on the lines suggested would be the formation of a limited company, in which the shareholders would be different British firms, each engaged in the manufacture of some of the articles to be sold, the list being so arranged that there shall be no internal competition between the members of the limited company, but that, taken altogether, a great variety of machines and productions shall be offered to the public. The same proposition has been made by authorities of eminence in respect of Turkey, Egypt, China, and other markets, and we believe that it has been actually tried by two or three firms in special countries—India and Egypt occur to us. Our manufacturers and traders might find it advantageous to consider further applications of the idea. Do we want always to work entirely single-handed, when, co-operatively, makers of different and non-competing classes of goods might reduce the cost of working in these places? A principal difficulty might perhaps be the finding of the right men, good in themselves, and sufficiently experienced in the Russian market to work the scheme; but if we do not seek the right men we cannot expect to find them. We have talked too long about the difficulty; if we gave the proper encouragement, the "right" men would come along.

Those of our readers who are sufficiently interested might communicate on the subject with the British Vice-Consul at

Kharkoff; but as well as, or before, that, let those who can do with more export business confer among themselves and devise their projects.

Car Lubrication.

While it is an almost impossible task to draw anything but very general conclusions from the mass of information on the subject of lubrication, bearings, gears, &c., which accompanied the report on "Lubrication of Car Bearings," presented at the recent Municipal Tramways Conference, there is no doubt that the replies of the 56 tramway authorities who were approached in this matter will be studied very closely in managerial sanctums, as, indeed, they were intended to be. An abstract of the report appears on a later page.

The replies bring forward very prominently the question of lubricant—oil *v.* grease—and if figures of cost were the only criterion, it would be difficult to form any definite opinion as to the best lubricant to employ with the bearings at present in use. However, if we rightly understand the sub-committee, the bearing is the crux of the question.

Given a suitable self-oiling non-leaking bearing to replace the crude designs at present in use, the superior efficiency and cheapness of oil as a lubricant would require little demonstration.

Tramway service admittedly imposes very severe conditions on the trucks and motors, but these are to some extent counterbalanced by the systematic supervision which is given to the cars, and which certainly does not fall to the lot of a good deal of machinery working under equal difficulties.

On the whole, we imagine that anyone who is conversant with the trend of modern design, as applied to bearings and lubrication, will be rather astonished that experiments on the lines of those which are being carried out by the sub-committee have been delayed for so long.

Touching on the other matters mentioned, we notice that some half-dozen undertakings have tried, or are trying, helical gears, which are much more silent in work, but unfortunately cost more, and do not appear to last so long as the ordinary gears.

It is also worth noting that case-hardened pinions have not given the results expected, although in both this and the above-mentioned departure from accepted methods, it appears a little early to form a decided opinion. The sub-committee refers to the interchange of ideas which a report of this kind brings about, and in this direction probably the greatest benefit will be derived by those concerned with tramway operation.

THE ANNUAL REPORT OF THE ALLGEMEINE ELEKTRICITÄTS GESELLSCHAFT.

The directors of the A.E.G., of Berlin, in amplification of the financial results which were recorded a fortnight ago, have now issued their report for the year ended with June, 1910. It is mentioned, in the first place, that the economic recovery continued during the year. As the movement had its starting point from the conditions in the United States, the extent of the development was prejudiced by the repeated interruptions in the upward movement in America. The German electrical industry was able to derive advantage from the recovery in economic life, and progress was only for the time being delayed by the circumstance that the Government and town authorities manifested reserve in their expenditure. It has also to be mentioned in this connection that the revenue tax on illuminating apparatus, as was apprehended from the beginning, caused a perceptible burden on working materials for electric lighting. The company's profits on securities brought forward from the preceding year had been employed, as was known, for the depreciation of new equipment provided during the year, and the similar profits realised in 1909-10 would only be brought into account in the new financial year. Owing to the growing demands upon the capacity of the works, a new site had been acquired at Hennigsdorf, where works are to be erected to amplify and complete the existing departments, and further sites had been purchased for the extension of the machine works.

The report proceeds to state that, according to number, quantity and weight, the products delivered considerably exceeded the turnover in 1908-9, and the value of the orders on July 1st, 1910, surpassed that on the same date in the previous year by £1,500,000. All the departments of the machine works were fully employed throughout the whole of the year. The output comprised 72,460 machines and transformers of 1,476,623 H.P., as compared with 47,351 of 1,239,639 H.P. in 1908-9. Although orders for machines of large outputs experienced a restriction through the incursion of the turbo-dynamo in their domain, the company made direct-current motors with individual capacities up to 13,000 H.P. for rolling mills, and very powerful rotary current motors for turbo-compressors and centrifugal pumps. A new and successful type was developed in the form of the rotary current commutator motor which can be regulated. The completion of the works for high-tension material placed the company in the position of being able to do justice to the large demands made on this department. An order for the 1,000th locomotive was on hand in locomotive construction. The signal factory now incorporated in the machine works obtained orders 50 per cent. greater than in 1908-9, and the turnover also increased by 15 per cent. In the turbine works 174 steam turbines of 363,188 H.P. were made, as contrasted with 152 of 226,507 H.P. in the previous year, although competition was very keen and prices depressed.

The value of the production in the apparatus works, notwithstanding the transfer of various branches to other departments, was greater than in 1908-9, and the sales also increased in connection with the reduction in the prime costs. The output of the screw factory exceeded that of the preceding year. The manufacture of electric heating apparatus experienced a thorough change by the introduction of a new heating material, and the turnover was doubled. All departments of the Oberspree cable factory were actively employed, the consumption of copper rose from 19,500 tons in 1908-9, to 23,000 tons last year, and extensive orders for rotary current cables for very high working pressures were on hand. The number of carbon-filament lamps delivered showed a slight increase, which was obviously due to the larger sales before the law on the taxation of illuminating appliances came into operation. It must be left for the future to determine whether the fate of this lamp was sealed. In any case its scope of employment would be limited in the measure in which the prices of metallic-filament lamps declined. The urgent demand for wire lamps led to the doubling of the manufacture. The production of lamps for train lighting and low-tension in connection with transformers, as well as of types of large candle-powers, had been undertaken; and an increase in Nernst lamps had only taken place in those of the projection type. After referring to the motor-car industry which exhibited signs of recovery, the report mentions that exhaust steam turbines were beginning to play an indispensable *rôle* in the lignite industry, and in the chemical, paper and cellulose trades. So far the company had supplied 250 motors of 350,000 H.P. for rolling mill works; the mining business had satisfactorily developed, and the number of main shaft winding engine installations completed by the end of the year was 135. The reorganisation of old transmission gear, as well as some new installations, kept the turnover in the textile department on the level obtaining in the preceding year.

The central stations completed or extended during the year represented 226,600 H.P. as compared with 161,415 H.P. in 1908-09, and work comprising 324,400 H.P. was in progress, as against 328,860 H.P. a year ago. In connection with the orders for the Victoria Falls and Transvaal Power Co., the erection of five turbo-dynamos each of 18,000 H.P., as well as of four steam and six electric compressors each of 4,000 H.P. had been commenced. The long-distance network for the two central stations at Rosherville Dam and Robinson was for the most part completed. Two further turbo-dynamos each of 6,000 H.P. had been set in operation at the Simmerpan station, and a new station of 36,000 H.P. and an overhead network of 37 miles for 80,000 volts, would shortly be taken in hand. After referring to the erection of various "overland" central stations, it is mentioned that considerable orders were on hand for the electric equipment of hydro-electric works. The company was interested in the introduction of single-phase working on the Dessau-Bitterfeld railway, and the new alternating current work comprised the Tinnos and Westjordals railway in Norway. The tramway business again showed an increase, as compared with the preceding year, and the lines closely associated with the company had for the most part made progress. The accounts indicate the following figures for the past two years:—

	1909-10.	1908-9.
Share capital	£5,000,000	£5,000,000
Gross profits	1,055,000	933,000
Administration expenses	23,900	25,400
Taxes	101,000	82,000
Depreciation	26,000	23,000
Net profits	902,000	802,000
,, and balance brought forward ...	921,000	819,000
Reserve fund	100,000	63,000
Directors' fees	25,000	22,500
Bonuses to officials	37,500	32,500
Pension fund	37,500	32,500
Dividend	700,000	650,000
,, per cent.	14	13
Carried forward	21,000	18,000

The company's credit at the bank amounted to £2,648,000 at the end of the financial year, as compared with £2,965,000 at the close of 1908-9, and the number of persons employed on July 1st, 1910, was 41,663, as against 33,056 on the corresponding date in 1909. The report finally refers to the projected increase in the company's share capital and to the impending acquisition of the Frankfort dynamo works of the Felten & Guilleaume-Lahmeyer Works and the close association with the latter company—a transaction which is declared to be the greatest carried out during the 27 years' existence of the A.E.G.

"COALITE": MANAGEMENT AND FINANCE.

The London *Daily Chronicle*, in its issues of September 19th, 20th and 21st, has been drawing attention to the unsatisfactory position of the British Coalite Co., and has stated that the whole matter of the flotation and management of this company requires investigation. Without committing ourselves to the complete accuracy of all the facts and opinions expressed by the writer of the *Daily Chronicle* articles, we think a case for an impartial examination of the British Coalite Co.'s present position and future prospects has been clearly made out, and that the sooner this occurs the better it will be for all concerned. As many readers of the Electrical Review may be interested, either directly or indirectly, in this company, we propose to sketch briefly the history of its career, and to summarise the main facts of the present position, as given in the columns of our contemporary.

The early public intimation of the discovery of a new form of fuel that was to take the place of coal for household purposes, and was thus to solve the problem of domestic smoke, was contained in a series of five articles which appeared in the *Times* in April and May, 1907.

The tone of these articles (which were well-written articles of the advertising type) may be gathered from the following extracts from the last of the series which appeared on May 4th, 1907 :—

> The plant used in the preparation of Coalite is entirely different from that used at present in the gas and coke manufacture. The stills are automatic and continuous in their action, and the coal fed in at the top emerges as Coalite at the bottom. As the apparatus undergoes no destructive high temperatures, the wear and tear is small, and the perpetual renewals common in gas-making practice are rendered unnecessary.
>
> Contracts have already been entered into with the leading coal merchants for the sale of over 2 million tons of Coalite per annum, for consumption in London only. As about 17 million tons of bituminous coal are burnt annually in the metropolis, much of which might with advantage and with economy be replaced with Coalite, there is a practically illimitable field of usefulness before the new fuel. Large contracts are at present under consideration for the erection of Coalite plants in most of our large cities, but meanwhile the founders of the new industry are developing the means for supplying London with Coalite, not only for domestic, but for industrial purposes. The supply is at present limited, but the output from the great works now in process of erection will be able, ere long, to cope with the already enormous demand, and place the new fuel in abundance on the market for the ensuing winter.
>
> Last, but not least, Coalite will bring to fruition the hopes of those who have written, preached, and striven for a cleaner life, and a purer atmosphere. At last it will be possible for Londoners to breathe a wholesome air, uncontaminated with the smoke fumes and fogs they have so long endured. Everyone will rejoice if the lives of our cathedrals and other national buildings may be lengthened, and if the beauty of our priceless treasures of art may be preserved. The flowers and trees in our parks and gardens will at least be able to grow with natural vigour, and, most important of all, we may rejoice in the thought that our children will not be handicapped by those abnormal and unhealthy conditions which the black smoke nuisance has so long imposed. They at least will see and enjoy the fulfilment of the long-cherished dream of a smokeless London.

These articles were a useful preliminary to the issue of the prospectus of the British Coalite Co., which appeared two months later, when the new company was found to be capitalised at £2,000,000, divided into £1,500,000 ordinary shares and £500,000 deferred ordinary shares.

Sir William H. Bailey, Mr. A. Cory Wright, Sir William H. Preece and Mr. C. Allen (of Messrs. H. Bessemer and Co.) were among the well-known business men who joined the board, and Mr. A. G. Kitching, a director of the Metropolitan Road Co., was the first chairman of the new company.

The statutory meeting of the British Coalite Co. was held on September 20th, 1907, with Mr. A. G. Kitching in the chair, and it was then stated that only half the ordinary shares had been subscribed for, and that the amount paid for the patent rights was fair and reasonable. Coalite, Ltd., the vendor company, is understood to have received £55,000 in cash and £500,000 in deferred shares of British Coalite, Ltd.

At this meeting the chairman stated that they had 3,500 shareholders, and announced that the company

> had accepted tenders for a considerable number of stills in which to manufacture their Coalite at Barking, which were to commence to be delivered within a week. They anticipated that the first would be in position and ready for work by the end of November (1907). The purchase of the company's freehold land at Barking was being completed, and the company was taking possession. The Coalite plant at Wednesfield, near Wolverhampton, was in the meantime continuing to manufacture Coalite, and the purchase of 60 acres of freehold land at Wednesfield had been completed. This land when bought was believed to contain coal beneath the surface, and it had now been tested by one of the most experienced colliery engineers in England, who estimated that over a million tons of coal, of the kind known as "Staffordshire thick seam," lay immediately beneath the surface, and was easily workable. This was very important to the shareholders, as the land for which they had paid £15,500 was now worth several times that amount, and thus the company would be provided with cheap coal for many years to come.
>
> The chairman proceeded to explain the difference between Coalite and coke, and stated that they need not fear competition in this direction. He was authorised to inform the proprietors of the Coalite Co. that negotiations were in progress, and would be completed in the course of the next few days, with one of the most important gas companies in the kingdom, for the erection of a Coalite plant, on the land and near the works of the gas company, to make half-a-million cubic feet of gas daily, which would be disposed of to the gas company on advantageous terms. The Coalite Co. would themselves retain and deal with the Coalite and other by-products. He believed that this would be followed by many agreements of a similar character. The directors were quite satisfied with the progress which had been made, and had absolute confidence in the future of the company.

This, then, was the position three years ago. What is the position to-day ?

At the last annual meeting of the shareholders of the British Coalite Co., Sir W. H. Preece, the chairman, admitted that the holders of the ordinary shares had some grounds for disappointment, and that great difficulties had been met with by the company in the development of their business at Wednesfield, Plymouth, Hythe and Barking. They were going ahead slowly, however, and were turning out over 400 tons of Coalite per day, the demand being quite ten times this amount. As regards finance, Sir Wm. Preece stated that they had plenty of cash in hand to complete their programme. £171,000 was still due to them from calls in arrears, and the directors were quite satisfied that Coalite, Ltd., would discharge their liability as regarded their portion of this amount early in the present year.

As a set-off to the somewhat optimistic account of the position of the company given by Sir Wm. Preece last December, the writer in the *Daily Chronicle* makes the following statements :—

"The Wednesfield Works, which comprise the original Coalite factory, a large foundry for turning out complete Coalite plant, a tar distillery, a gas-power installation and an electrochemical plant, have cost £120,000, and are now in danger of being shut down. The Coalite manufactured there cannot successfully compete locally with coal in price, the demand for complete Coalite plants on the part of the gas companies is small, while the local authorities of Willenhall and the neighbouring districts, have been complaining of the smoke and fumes arising from the company's operations at this works.

"*The Hythe Gas Works Plant.*—The plant here was installed by the British Coalite Co., and had a capacity of 70 tons coal per day. This plant was shut down last May, and the Gas Co. has returned to its former method of manufacturing gas. The cause of this change is stated to be the 'stench' and nuisance created by the manufacture of 'Coalite,' and the small demand for the product when made.

"*The Plymouth Gas Works Plant.*—This is the only other gas works plant that has been installed by the Coalite Co. in this country, and the demand is stated to be small, while the cost of repairs and renewals is heavy. The tendency here is to reduce rather than to extend the plant.

"*Barking.*—There are two jetties here, and a large coal carbonising plant has been erected. Many retorts have been built and discarded long ago as useless, and the whole works was shut down in May of the present year, and had not been reopened in August. A tar distillery, the completion of which was promised in August, 1909, was not at work 12 months later."

The *Daily Chronicle* critic closes his third article with the following summary of the three years' work :—

> Three years' experience has proved that the estimates and prophecies of those responsible for Coalite are not worth the toss of a thin sixpence. There is not a single solitary promise which has been made which has come within miles of fulfilment.
>
> Where is the estimated output of millions of tons of Coalite? Where is the estimated profit? Where is the power scheme? Where is the possibility of hundreds of gas companies adopting the Coalite plant? We could continue to ask questions of this character regarding every promise which has been made by the company, and echo would always have to answer monotonously, "Where?"
>
> It is a matter for the new debenture-holders, as well as for the shareholders.
>
> One has only to remember that the shares of Coalite, Ltd., were once £44, and are now £3¼, and that the shares of British Coalite have fallen from 22s. to about 6s. (and it would be difficult to sell many at that figure), to see where the concern is drifting.

As regards finance, the *Daily Chronicle* critic states that in July of the present year the British Coalite Co. was forced to make an issue of £300,000 first mortgage debentures, in spite of Sir William Preece's statement in December that they had plenty of cash to complete their programme.

Two facts stand out clearly from these conflicting accounts as to the present position and future prospects of the British Coalite Co. The first is—that the holders of the ordinary shares have not up to the present received 1 cent of dividend upon their capital, and that the value of these shares is shrinking rapidly. The second is—that the demand for Coalite, which is supposed to be general and widespread, has not enabled the directors of the company to overcome the difficulties met with in the development of their process. If in addition to these two facts, the assertions made by the *Daily Chronicle* writer are correct, we think a case for inquiry has certainly been made out. Coalite may possibly be *the* domestic fuel of the future, and may be destined to solve the domestic smoke problem. Upon its merits in this respect we have not attempted to touch in this article. But the technical and financial management of the company which was floated with much *éclat* to promote its manufacture and use, has certainly been faulty.

ELECTRIC POWER IN THE TRANSVAAL.

We commented very fully in two of our recent issues on the recommendations of the Transvaal Commission on the subject of electric power on the Rand, but we postponed further consideration of the matter until the Electric Power Act was available. It was to be expected that the Act would be mainly concerned with the large power companies of the Transvaal, but one hardly anticipated it to be so out-and-out a measure of bulk supply.

It is enacted that no person except the Council of the Municipality shall engage in an undertaking to supply to any other persons power exceeding 20,000,000 units in one year, unless the undertaking be licensed, but undertakings existing prior to the commencement of the Act may be continued for one year and no longer, unless licensed under the Act.

It is clear that there are not many power schemes excepting the largest which would fall under such a denomination. Certainly there are not 10 undertakings in the United Kingdom which have a greater output than that upon which the Transvaal Government has legislated.

As a kind of afterthought, it is true that recognition is paid to the undertakings which are to generate less than that amount of energy per annum, and it is provided in the Act that if any person or company desires to carry out a private supply of electricity not exceeding 20,000,000 units, he may obtain permission from the Governor.

It clearly means, therefore, that anyone is in a position to enter into a public supply undertaking without being unduly interfered with, so long as the permission from the Governor is obtained, and assuming always that the supply does not exceed the figure set forth in the Act. We do not suggest that such an undertaking would be free from ordinary legal obligations, but it is apparent that a reasonable-sized system could be constructed without statutory powers being necessary.

It is true that a company supplying electricity on such a basis would be confined to a comparatively restricted area, but all the same a respectable business could be built up without let or hindrance so far as the present legislation is concerned. It would be open, we presume, to the Governor when giving his permission to an undertaking to insist on certain provisions being complied with, and these might possibly be worse than the conditions laid down in the new Act. Yet, on the other hand, the Governor might on some occasion be induced to give consent to an electrical undertaking which was not subject to the usual statutory powers. In any case the future of electrical power systems in the Transvaal, under the 20,000,000-unit limit, is entirely in the hands of the Governor and his immediate advisors. Whether that arrangement is a desirable one in the public interests depends entirely on the Governor who is in office at the time, but as this high functionary is changed from time to time, an occasion might arise when the arrangement did not operate in a satisfactory manner, either in the interests of the company concerned or in the interests of the public.

There is a further danger, and one which is always present, that with the best intentions in the world considerable hardship from purely adventitious causes might be inflicted on a concern seeking to supply electricity on a small scale. There should be no variation in the treatment of such propositions, but without some clearly defined conditions it is possible that abuses might creep in from time to time.

It is quite clear that the most pressing question at the moment is the supply of electricity on a large scale, and the legislation to which we are referring is clearly aimed at defining the position of such concerns as the Victoria Falls power supply and other similar undertakings, but at the same time it should have been remembered that the Transvaal is growing fairly rapidly, and it is quite obvious that there will be a corresponding growth of electricity undertakings in comparatively restricted areas; and it would have imposed no special difficulties on the Legislature to have brought in more provisions for regulating such systems, and thus to have consolidated the legal position in regard to all electricity supply undertakings.

It is laid down that all undertakings supplying more than 20,000,000 units, must be licensed, even those systems which existed before the commencement of the Act. Apparently the fullest information is to be given by a concern when applying for such licence. Full particulars relating to the company are to be provided; also relating to the situation and extent of land for sites for generating and distributing stations; names of owners and occupiers of such land; proposed sources of water for the undertaking; area of supply; route of transmission lines; powers required for breaking up roads, &c.; proposed schedule of prices to consumers, and minimum to be supplied to any consumer; estimated cost of generation, contracts entered into, &c.

It is to be presumed, therefore, that the present power companies will be called upon to give some interesting information concerning themselves, and unless they comply with the provisions of the Act they are liable to have their licence refused. It is not to be supposed that the existing companies object to complying with reasonable legislation, and at the same time it is not desirable in the public interest that the power companies of the Transvaal should be subject to any harsh legislation.

There does not appear to be any set attempt in the Act to prevent the legitimate expansion of electricity supply, and in this respect a lesson has been learned from the English enactments on electrical matters, for there appears to be a complete absence of the unnecessary and harsh conditions which have disfigured electrical legislation in this country.

The licensee is not entitled to supply power within a municipal area without the consent of the Council itself, except for mining purposes or to the railway administration, or to any Government Department; but the consent of the municipality must not be unreasonably withheld, and in case it should be the Governor may permit the initiation of a public supply without the consent of the Council.

It is not likely that the large power concerns will desire to enter the towns except for mining purposes, or for the

purpose of furnishing a bulk supply; but at any rate, the power is given to the Board to override a municipality in the event of its pursuing a "dog-in-the-manger" policy.

It is to be presumed that there is no intention on the part of the legislator to permit anything in the shape of a competitive supply against a municipality, although the Act does not appear to be quite precise on this point. It does, however, very clearly set forth that the granting of a licence does not mean the establishment of a monopoly, and, if it were thought desirable, a second licence might be granted in a district in which a supply was already being given.

In our articles dealing with the report of the Commission, attention was drawn to the fact that much of the confusion concerning electricity supply in the Transvaal, had arisen from the illegal transfer of licences, and that in effect the suppliers of electricity had taken advantage of the change of Government to do acts which were not intended in the original powers.

While the Act does not specifically deal with previous instances, it is clear and emphatic on the subject of future transfers, and enacts that no licence can be transferred without the consent of the Governor. It puts further limitations on the licensee, in that he must neither carry on any other business or undertaking, nor in the generation of electric energy use coal from any mine in which he is interested, directly or indirectly.

On the face of it, such a provision might have a peculiar appearance, and certainly the effect of it is bound to have an important bearing on the question of electricity supply in the Transvaal.

In the first place, it prevents any mine-owner becoming a supplier of electricity on a large scale because he is interested in some other business; consequently, if any agreement existing between the Victoria Falls Co. and the mining companies includes any clause by which in the event of failure of supply the mine might have power to step in, it is completely abrogated by the new Act.

It is not an unusual provision for a large consumer, in order to protect his position, to have power to step in and operate the plant, but apparently such a condition would be illegal under the Transvaal Power Act. The clause relating to the coal from any mine in which the licensee may be interested, is obviously the result of the agitation set on foot by the principal coal-owners of the Transvaal. It was clearly established that the development of power on the Vereeniging Estates was for the purpose of utilising the coal which existed there, and it will be interesting, therefore, to see how the Victoria Falls Co. can utilise the Vereeniging coal without infringing the Act. At any rate, the Vereeniging mines are owned by Lewis & Marks, who are directly interested in the Victoria Falls Co., and for that reason it would be interesting to know whether the Act is to be complied with, or whether any special dispensation has been vouchsafed to this powerful group.

It is obvious that the mine-owners of the Transvaal have scored an important point, although, curiously enough, the aims of the owners did not meet with much sympathy from the Commission in their report.

It is specially set forth that a licence does not confer any monopoly, and there are other provisions to be complied with which might operate to the disadvantage of the supply company. For instance, the Governor appears to have powers under which he can fix a limit to the amount of power to be generated. Moreover, power must be supplied to every person applying for it in the area of supply.

It is, of course, open to an undertaker to refuse a supply, in which case the matter would be referred to the Minister, who would decide the charges and conditions under which a supply would be carried out. There would be a time limit, in which the supply could be given; for instance, after the Minister had decided that the supply was to be given, it would be necessary to supply:—300 KW. within six months; 600 KW. within nine months; 1,000 KW. within 12 months; 2,000 KW. within 15 months; 3,000 KW. within 18 months; after which the Minister has power to decide when the supply should be available.

It is not necessary to refer in detail to the various provisions, but it is interesting to refer to the salient points regarding the price of energy, and the methods proposed for dealing with surplus profits.

In a manner similar to the powers possessed by the British Board of Trade, the price of energy can be revised at the end of seven years, and afterwards at intervals of three years. The reduction in the price of electricity at the end of such a period, however, is not to be more than one-half of the reduction effected during the interval, in the cost of supply of power. If, therefore, a power supplier by means of new plant, or the adoption of a new system, were able to reduce his costs of production, half of such saving must be given to the consumer.

The licensee, however, must do more than this for his consumer, as he is compelled under the Act to give him 25 per cent. of the surplus profits, but we are afraid that this provision is not quite as handsome as it sounds, for the reason that the surplus profits are calculated after all charges have been made and interest on share capital and debentures has been provided for. It is quite clear that, with the elasticity usually associated with maintenance charges, there should be no insuperable difficulty in demonstrating that there was very little surplus profit after due provision had been made for the charges set forth in the Act.

An interesting clause is included which has a bearing on the promotion of supply companies, it being set forth that the consideration to a vendor, promoter, or founder, shall not exceed 20 per cent. of the share and debenture capital. We think, however, that few vendors or promoters would be inclined to cavil at such a provision.

Various matters in regard to price, especially if they involve dispute, are to be referred to the Minister, and it is clearly enacted that any charge to a consumer must not be reduced without first obtaining the approval of the Minister.

Further, no special preference can be given to a consumer, without the consent of the Minister for the time being. This, of course, means very little, and from the consumer's point of view, is about as useful as the provision under the English Electric Lighting Act, under which it is clearly set forth that no customer shall have preference in regard to charges.

Various provisions are included by which it is possible for a licence to be revoked, under which circumstances it is open for the Governor to purchase the undertaking on terms.

The Government reserves to itself the power to take over an undertaking after 37 years, upon due notice being given, and upon payment of the then value of lands, buildings, plant, &c., but no addition is to be given for either goodwill or prospective profits.

Certain stringent provisions are included to deal with persons stealing electric current, or unlawfully interfering with apparatus to cut off the supply of current, such an offence being punishable by a fine not exceeding £1,000, or imprisonment not exceeding 10 years.

Due regard is paid to the provisions of the Irrigation Act and Precious Metals and Base Metals Act, and to the use of water for power purposes, but there appears to be nothing of any special note in connection with them.

The Act is to be administered by an advisory committee known as the Power Undertaking Board, the Government Mining Inspector is to be chairman of such board, and all the members are to be officers in the railway or public services. The number of members is not to exceed five.

International Carbide Syndicate.—A Zurich newspaper announces that after endeavours extending over two years, success has now attended the scheme for the formation of an international syndicate of carbide of calcium producers, and the agreement has been signed in Paris for a period of 10 years. The syndicate is said to comprise as constituents almost all of the 58 carbide works in Switzerland, Austria, Germany, Italy, France, England and Scandinavia.

The Proposed New Cable Factory.—It is reported, in amplification of the intimation which was given in this journal a week ago, that the largest portion of the increase of £87,500 in the share capital of the DEUTSCHE KABELWERKE is to be devoted to the purpose of the English subsidiary company, the Union Cable Co. The latter undertaking is to be considerably extended, and the whole of its share capital is said to be held by the German parent company, which, after providing for the development of the English company, will only have left a comparatively small portion of the whole amount of the augmentation in the share capital.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Lightning Conductors.

Like "W.H.B.," I have been very interested in the discussion that has been taking place in your columns, and I am very sorry to see it ended. There seemed to be something in the background that I hoped further letters would have made clear, but, so far as it went, it was decidedly instructive.

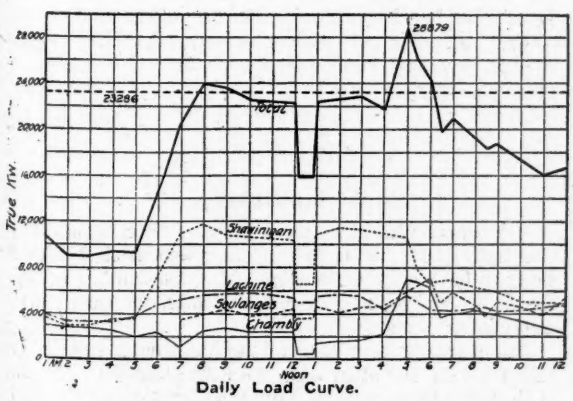
I should be very envious of "W. H. B.'s" good fortune if he succeeds in arranging the informal discussion he refers to. Could this not take place in public? Others might like to be present; I should, for one. Could not one of the gentlemen referred to be persuaded to read a paper at the Institution of Electrical Engineers, or, as Mr. Alfred Hands is not a member (and better for me, as I am not, either) give a lecture somewhere so that all who desired could attend? I suggest this should deal specially with controversial questions, and that it be followed by a discussion in the usual way.

A. W. P.

Restricted-Hour Supply.

The article by Mr. Pringle, of Burton-on-Trent, in your issues of August 26th and September 2nd, deserves, I think, better than to be buried in the mass of literature which is daily being published on matters electrical.

If Mr. Pringle's statement is correct, viz., that "The falling off in the lighting revenue has been so serious in the past two years that the undertaking would undoubtedly have been thrown upon the rates if the new demand obtained from the restricted-hour system had not been in operation," then it is surely time for any other undertaking in a similar way to consider seriously the advisability of following upon these lines. Mr. Pringle tells us, moreover, that, instead of having the above deficit, they have had an average of nearly £1,000 surplus during each of the last six years. He



Load Curve, Montreal, December 1st, 1909.

further states that the cost of the additional units has been only ·15d. for fuel, and that another ·3d. to ·4d. would cover the whole of the other charges necessary to be levied. Engineers will also, no doubt, note with interest that, on a total motor load of 955 H.P., Mr. Pringle has no less than 766 H.P. worked on the restricted-hour system, a good deal of which he would not have been able to obtain at all but for the terms he has been able to offer on that system.

It may be of interest to compare the load curve obtained at Montreal for December 1st, 1909 (enclosed herewith) with the load curve in the same town for 1903, published in the *Electrician*, of September 30th, 1904. Montreal has consistently worked on the restricted-hour system for at least the last seven years, and the load curves which it has developed are enough to make any English central station man envious. You will notice that the present curve has a small peak of about 5,000 KW. above a dotted line which represents the averages of the maximum loads throughout the year. With regard to the question of the offering of a restricted-hour supply causing a fictitious peak to be developed, which might exceed the evening peak (which was one of the objections raised against my proposals in 1904), I understand that Mr. Pringle has got over this by offering the restricted-hour terms in a tentative manner, stating that only so many kilowatts can be added during the following year, and leaving it open to make a fresh offer every year. With an arrangement of this sort it seems as though the fictitious peak difficulty would be obviated.

In conclusion, I would recommend your readers to study carefully Mr. Pringle's article, which will, I think, go far to convince them that even a station which has a traction load in addition to its lighting load, cannot afford to neglect the additional revenue which would be brought in by a restricted-hour load.

A. M. Taylor.

King's Heath, *October 1st*, 1910.

An Arrangement among Manufacturers.

The question of prices of electrical machinery seems to be as pressing to-day as it was 12 months ago, and as far as one can judge it is likely to remain unsolved for some time to come.

It is commonly supposed that when things are at their worst they are on the point of mending, but while matters in the electrical world are gloomy in the extreme, one must be of more than ordinary sanguine disposition to take a hopeful view of the immediate future.

Obviously I have in mind the manufacturer of heavy machinery, for while there is a considerable amount of cutting going on in that branch of the industry which concerns itself chiefly with accessories, &c., it does not appear to be quite so acute as in the heavier branches of the business.

On such occasions it is urged that if the demand were equal to the supply there would be an automatic raising of prices, but it is very doubtful whether any such rule could be applied to the electrical industry, for, after all, it has to be borne in mind that the manufacturers of large machinery are not particularly short of work at the moment.

It may be that there is not a great deal ahead, but still there is a moderate demand not only from the public bodies, but from the various industries in the country. Yet so far from this improving prices, the tendency is distinctly in a downward direction.

It seems difficult to realise that such an unsatisfactory state of things must continue, yet, according to the opinion of engineers in responsible positions, there appears to be no arrangement possible among the manufacturers by which their position might be improved.

A permanent improvement in English conditions would be difficult to secure unless German competition were limited or very much reduced, yet one can hardly accept the position as incapable of improvement.

The whole position seems to suggest that the English manufacturers are "sitting with their hands in their laps" waiting for something to turn up, yet this is not the attitude which one would have expected from the firms with which the writer has had some personal acquaintance.

That there are difficulties in arriving at a comprehensive scheme goes without saying, but it is impossible to believe that there are not sufficient brains among the manufacturers to formulate some arrangement by which the present race to Carey Street can be arrested.

It may be thought easy to stand outside the arena and give advice, but while some of us may not appreciate all the difficulties that exist, the spectator, after all, sees most of the game, and without being unduly optimistic, it seems to the writer that the present deadlock should be capable of removal.

It has been frequently said that only a financial genius could set matters right among the electrical manufacturers, but surely a reasonable willingness on the part of those interested in the question, with the exercise of some common sense, may do all that is necessary to improve the lamentable state of affairs which at present exists.

To suggest a remedy is not my object in writing, because I may not be sufficiently familiar with all the ins and outs of a

complicated business. On the other hand, I am constrained to point out that the whole of the capital involved in this country in the heavy manufacturing side of the industry, is not greater than the capital of the largest German organisation.

It is true that there are existing some widely divergent interests, but I should have thought that even these might be made subservient to the common good of the shareholders. I believe that attempts have been made from time to time to bring the manufacturers into line, but apparently no permanent results were obtained. Notwithstanding these failures, however, I decline to admit that the last word has been spoken on the subject.

Onlooker.

Sale of Lamps.

As an electrical contractor, I should like to ask the question, "Where do we stand with regard to the metal-filament lamp trade?" First of all, a correspondent in your columns reported that a large lamp manufacturing firm in the Midlands had been advertising their name and address direct to consumers. Then a report has gained currency that one or two of the London tungsten lamp manufacturers are opening a special consumers' department, from which they supply these goods direct. To still further "assist" the contractor, a large firm of tungsten lamp manufacturers, who are widely advertising on the public hoardings "Support British Industries," are, I am given to understand, floating or supporting a company for the purpose of "hiring out" their lamps. Has any of your contractor readers heard that a new West-end restaurant has been fitted out on this principle by the firm in question? Further, I am given to understand, by people who should be in a position to know, that this "all-British" firm is practically subsidised by a German lamp manufacturing firm controlling similar patents. Now, once again, let me ask, "Where does the contractor come in, if manufacturing firms are so busily engaged in taking the bread out of his mouth?" These facts, coupled with tungsten "rings," municipal sales departments, &c., make one ask, "Is the game worth a candle?"

Fair Play.

Sterilisation of Milk.

I was much interested in the article on "Sterilisation by Quartz Lamps," which was published in your paper on September 2nd.

I should be much obliged if you could ascertain if the process has been applied to milk in a manner suitable for commercial use, and, if so, the name of the firm who have the matter in hand.

Frank Kelly.

Southampton, *September 29th*, 1910.

The Association of Mining Electrical Engineers.

When the Association of Mining Electrical Engineers was formed, I understood that it was for the benefit of practical colliery electricians, to improve their status and to give them an opportunity of introducing reforms for the greater safety and efficiency of electricity in mines, but it appears to me that the Association is not going to benefit colliery electricians in any way.

There are two policies outlined for the benefit of the Association—one by the Electrical Review, and one by Mr. Maurice, President of the Association.

The Review policy is that all mining electrical engineers should have a thorough mechanical and electrical knowledge, but Mr. Maurice, in an address read before a meeting of the Association at Glasgow, on September 17th, is reported as follows:—

"In these days, not only the actual colliery electrician, but every under-manager, deputy, enginewright, fitter and motor-driver ought to possess as much knowledge of electricity as he is capable of acquiring. It could not be too clearly or too frequently urged that the Association existed for these men, and that any person who was associated with electrical work in mines, in any capacity, could join and reap all the practical benefits of membership. He (Mr. Maurice) was particularly anxious that membership should not be regarded as exclusive to qualified electricians."

With regard to the former policy, I would suggest that there are not a large percentage of collieries who could maintain both a mining electrical engineer and also a mechanical engineer, so it appears to me that the mechanical engineers would eventually obtain the power, merely studying electricity in addition to their ordinary subjects. With regard to the second policy, I entirely disagree with Mr. Maurice, and I should like to ask him how he would like to include colliers, &c., in the membership of the Association of Colliery Managers, of which he is, no doubt, a member.

I would also like to remind him "That a little knowledge is a dangerous thing," and I would advise all colliery electricians to protest most strongly against any under-manager, enginewright, deputy fitter or motor driver, interfering with any electrical apparatus whatever. I have had some experience of under-managers' deputies, &c., interfering with motors, &c., and only recently I found a 130-ampere copper fuse wire put in circuit with a 500-volt 4-H.P. motor.

If we are going to have such persons as these interfering with electrical machinery, electrical fatalities in mines will go up with a bound. Would Mr. Maurice have motor drivers endeavouring to repair motors, &c.? If so, I pity the electricians who work under him, for their work will be increased enormously.

Let under-managers, &c., read the rules and study the theory of electricity as much as they like, but do not let them interfere with electrical machinery, and do not let them join any association formed for colliery electricians.

I would like to suggest to the members of the Association of Mining Electrical Engineers that membership should be limited to colliery electricians in charge of plant, and that various examinations be set, as in the Institution of Electrical Engineers. The mechanical and electrical departments at a colliery should be kept separate, and the electrician should have as much power in his department as the enginewright and the under-manager have in theirs.

"A Council Member" informs us that colliery managers only number 20 per cent. of the total membership of the Association, but I would like him to inform us what percentage there is of under-managers, deputies, enginewrights, &c., and what percentage there is of electricians actually in charge of plants.

Practical Colliery Electrician.

Modern Lighting.

I have pleasure in referring your correspondent to Chapter 2 of Mr. Solomon's excellent treatise on "Electric Lamps" for a clear explanation of the relationship between the visible and total radiation from lamps, and the means of determining the same.

The quartz mercury vapour lamp has a lower specific consumption than any other lamp with the exception of certain of the latest types of flame arcs, the objection to which, in many services, is the very high candle-power which must be adopted per lamp to realise this high efficiency.

C. Toone.

Kent, *October 3rd*, 1910.

Electricity in a Laundry.

In reply to your correspondent "Hand Launderer," we have four laundries in our town, in which the machinery is driven entirely by electric motors. One of them previously used a steam engine, another a gas engine, and the other two were new laundries in which electric driving was adopted.

"A"	has a 7-H.P.	motor,	connected	1901.
"B"	do. 3-H.P.	do.	do.	1902.
"C"	do. 10-H.P.	do.	do.	1906.
"D"	do. 7-H.P.	do.	do.	1907.

In all four cases the owners are perfectly satisfied, and they have no desire to change to any other form of drive.

A low-pressure boiler is used in each of the above cases for heating purposes, and I suggest the same arrangement to your correspondent.

S. D. Schofield, M.I.E.E., A.M.I.M.E.

Electricity and Tramway Power Station,
Shipley, *October 3rd*, 1910.

In answer to your correspondent, "Hand Launderer," I should certainly advise him to adopt electricity as his driving power.

My own experience is, that in spite of having to use steam to heat water and the bed of the calender, you more than save the cost of the electricity in your fuel, and then, of course, you have the convenience of the motor, which saves all the worry and trouble of a steam engine—no small matter to a man in a small way of business such as your correspondent. If "Hand Launderer" would care to call on me, I should be pleased to go into the matter with him in more detail than is possible in the columns of a newspaper.

A. C. King.

Hackney, *October 3rd*, 1910.

Electrical Organ-Blowing.

With regard to "Organist, A.M.I.E.E.'s" letter in your issue of 23rd ult., I have not only devoted time and thought to the question of organ blowing, but have had considerable practical experience in this matter. It is quite true that when driving feeders the consumption of energy does not decrease in strict proportion to the wind used, though there is an appreciable reduction.

When blowing by means of a fan, I find from data which I have collected, the consumption of energy with no load (throttled outlet) is from 55 per cent. to 60 per cent. of that at full load (open outlet). In general the proportion of the useful energy to energy supplied is perhaps rather more with the fan than with the feeders.

However, what has to be considered is not whether the motor is controlled efficiently, but what the bill for current will be.

Taken as a whole, a motor, together with the feeders it is driving, is considerably more economical in power consumption than a combined motor and fan. For example, to deliver 800 cb. ft. of wind to a reservoir weighted for 4½ in. water gauge, the most efficient type of rotary blower, of which I have experience, namely, the "Discus," would require 1,680 watts at full output, making an allowance for a drop of ½ in. in pressure between the fan output and the reservoir.

To deliver a like quantity, 800 cb. ft. at 4½ in. water gauge, by means of three suitably sized feeders, running at, say, 35 strokes per min., a 1-H.P. motor will be used, which would be called upon to develop ·85 H.P. on the average. Personally, I much prefer a slow-speed motor, running at, say, 240 R.P.M., driving by means of belt or chain direct on to the three-throw crankshaft. The efficiency of such a motor is somewhat lower than that of a high-speed motor, but this is more than counterbalanced by the increased efficiency of the drive as compared with a double belt reduction with countershaft, wormgear, or other speed-reducing devices.

Such a motor will consume at full output 860 watts, which, it will be noticed, is rather less than the consumption of the fan at no load.

However, when it is taken into consideration that an organ, in general, is in use for only a few hours per week, the slight difference in actual money cost is as nothing compared to the saving effected by either of these arrangements as against water or man power.

My experience has always been that every installation must be considered on its merits. Where only alternating current is available, a high-speed motor must be used, and a rotary blower is the most convenient arrangement. Also, in existing organs where the feeders are so arranged that it is impossible, without great mechanical complication, to adopt a direct-motor drive, the fan is of value where continuous current is available.

The simplest method of all, and undoubtedly the most silent, is the slow-speed motor driving the crankshaft direct. In this last case, which is by far the most common, the method of control is simplicity itself. A regulating rheostat is provided, operated from the reservoir automatically, having sufficient resistance to bring the motor to rest when the reservoir is full. Additional contacts are also provided, on the first of which the contact arm rests when the reservoir is empty. As soon as the single-pole switch at the console is closed, the motor starts up slowly at first; as the reservoir rises the starting resistance is cut out until the contact arm reaches full speed position; as it rises higher, resistance is again introduced in the armature circuit, slowing down the motor to meet the demand made by the organist. With such a controller the time taken from closing the switch until the instrument is ready to be played varies from 3 to 10 seconds, according to the size of the installation and the number of auxiliary reservoirs of lower pressures which fill up before the main reservoir lifts.

I have found that for a specified output of wind the feeder arrangement takes less power than the rotary blower, and that no difficulty in regulation need be met with, if the proper apparatus be used. At the same time, the actual running cost of both is so small, that should conditions show that the rotary blower is more convenient, there need be no hesitation in making use of this arrangement.

R. A. Marples.

London, E.C., *October 4th*, 1910.

Coal-Cutting Machinery and Electrical Accidents in Mines.

Referring to the correspondence which has taken place on the above subject, and Mr. Burdon's letter in your issue of September 16th, I should like to point out that in many cases it is not sufficient to rely on an earth plate on the surface only. The object of an earth wire is to keep the potential of the earthed motor, switch case, or cable armouring (as the case may be), the same as the surrounding ground, so that in case it accidently becomes alive, it is impossible to obtain a shock to earth from it.

Now in a colliery, more or less non-conducting strata may often occur, and in addition to this the foundations on which the motors are mounted are frequently practically insulators, so that under certain conditions an earth wire carried to bank and to an earth plate at the surface only, may be an actual source of danger.

In a paper which I read before the Institution of Electrical Engineers early this year I gave a diagram illustrating such conditions, and pointed out that in addition to the earth plate at bank there should be, if possible, an earth plate at or near every motor, and certainly in every stratum.

Of course, there are many cases in which this may be unnecessary; but, in my opinion, the best way to earth any colliery installation is to carry a separate earthing cable to an earth plate at bank, and supplement this with suitable earth plates underground also, each of these earth plates being connected to the main earthing cable.

W. Wellesley Wood.

Newcastle-on-Tyne,
September 27th, 1910.

Argentina.—Permission having now been granted, the construction of two underground railways in Buenos Ayres, will soon be commenced. These projects have been under consideration for two years, being rendered necessary by the increasing congestion of the city streets. The concessionaires are the Anglo-Argentine Tramway Co., who intend to construct a shallow double-line railway to unite the Plaza de Mayo and the Plaza Onci de Septiembre, and to run up to eight-car trains on the multiple unit system; and the Western Railway Co., which is to extend its line near Calle Sadi Carnst by means of a tunnel line under the city to junction with the Government lines of the capital for goods transport. Provision is to be made, however, for an interchange of traffic with the line of the Anglo-Argentine Co.

THE BRITISH ASSOCIATION MEETING AT SHEFFIELD.

Atmospheric Electricity.

On Tuesday, September 6th, Section A of the British Association engaged in a discussion upon "Atmospheric Electricity," which was opened by Dr. Charles Chree, while Sir Oliver Lodge, Dr. Shaw, and Sir Joseph Thomson contributed to it.

Dr. Chree spoke principally of the potential gradient of the atmosphere, and referred to the more or less definite periodic changes to which it was subject. In making observations, difficulties were encountered; for instance, kites and balloons did not keep still, and themselves interfered with the observations. Mountain stations, as also that on the Eiffel Tower, showed that there was a 12-hour term, which was confined to the lower levels of the atmosphere. At the top of the Eiffel Tower, the phase angle of the 24-hour term differed by nine or ten hours from the same term at the ground level. There was a monthly term, and an Olympiad, or 11-year term.

At Potsdam, during the five years from 1903 to 1908, the fluctuation from the mean value of 233 volts per metre was only 5 per cent. This variation was higher than in any other station. In 1909 the Potsdam values went up to 340 volts per metre, and a corresponding rise was expected for this year. Dr. Chree did not know the reason for these changes.

Sir Oliver Lodge would probably be able to supply some important information as to the effect of electricity upon growth.

Dr. Chree mentioned Dr. Simpson's suggested explanation of thunderstorms, remarking that it required rain, and also an upward current of air having a velocity of 15 miles per hour.

It was more dangerous to stand under an oak than under a beech. The safest thing to do was to go upon a golf course and lie down in a bunker, provided always that other golfers did not go on playing. One person out of every five killed was a woman. Dr. Chree remarked upon the difficulty of obtaining funds for carrying out investigations, unless practical results were immediately forthcoming.

Sir Oliver Lodge said that the 24-hour period was not only due to the position of the earth with respect to the sun, but also to its position in space. From 6 a.m. to 6 p.m. the earth faced forward, when it was picking up material. The monthly period, unless it were lunar, seemed artificial. He was glad to find that such an important subject was placed in such competent hands.

In fine weather, the gradient was positive upwards, and the sign changed when the weather was wet. Which of the two was cause, and which was effect? If electrification had an influence on the weather, it might be possible to control the weather. If he were a large capitalist he would try to interfere with the potential gradient. He could bring down a cloud of steam in a laboratory. In Western Australia clouds frequently gather, and go away again without any rain having fallen.

As to the effect upon vegetation, it was noticed that in the Arctic regions plants grew rapidly. Plants in a greenhouse grew better when the aurora was imitated. Their experience, or superstition, was that in long spells of drought or sunshine there was no electricity required; while if it was wet, the provision of positive electricity improved and quickened the crops by 30 per cent., according to the farmers. During one year negative electricity was supplied, and found to be useless. He (Sir Oliver) wished to repeat the experiment, but encountered objections from the farmer. Beans were not helped by positive electricity. Plants exposed to an ultra-violet arc through quartz discharged electricity considerably. Sunshine was absorbed by chlorophyll, and there was a current down the petiole of the plant. What sunlight did might be done more readily by static electricity. The effect was not due to manuring consequent upon nitrification.

Dr. Shaw thought Sir Oliver might work out the effect of a reversal of the earth's natural field in the laboratory. The amount of energy required would be so large that artificial control of the weather would be practically impossible. Had atmospheric electrification in calm weather anything to do with that of thunderstorms? There were very vigorous upward air-currents. Sir Oliver Lodge had carried out experiments in which a charged tea-tray was used to represent a cloud. He (the speaker) remembered that in "Alice in Wonderland" there was a reference to

> Up above the world so high,
> Like a tea-tray in the sky,

but what exactly was it in the atmosphere which corresponded with Sir Oliver Lodge's tea-trays?

Sir Joseph J. Thomson did not quite follow Dr. Shaw in his remarks as to the amount of energy required to change the earth's field. The energy was already there, to be changed from potential to kinetic energy. The energy of the rainfall was not in question. He foresaw, with reference to artificial control of the weather, political, rather than scientific, difficulties.

Rain probably carried negative electricity. At the falls of the Zambesi the potential gradient was 20,000 volts per metre. When air passed over the sea, its radium emanation was small, but it was larger after passing over land. Water deposited more readily on negative electricity, and gravity brought the negative ions down, separating the positive and the negative electricity. It was not a formidable difficulty if rain were absent, as it might have fallen elsewhere. "This is a theory," said Sir Joseph, "which the facts do not compel us 'to absolutely give' up."

Dr. Chree, in replying to the discussion, said that an isolated rain-cloud acted to some extent like a tea-tray, by decreasing the gradient and changing the sign before the rain fell. The gradient near the surface of the ground fluctuated during a fall of rain. He thanked those who had spoken in the debate.

The president, Prof. E. W. Hobson, moved that the thanks of the meeting be accorded to Dr. Chree. The motion was carried by acclamation, after which the Section divided up into two parts, the one dealing with mathematics and physics, and the other with cosmical physics and astronomy.

In the first of these, Prof. Féry's paper on "An Auto-Collimating and Focusing Prism, and a Simple Form of Spectrograph," was read.

A speaker inquired as to what was the minimum wave-length of the light to which his apparatus was sensitive, and Prof. Féry replied in French, after which the thanks of the meeting were accorded to the author and to the reader of the paper, on the motion of the president, Prof. Hobson.

Mr. W. F. G. Swann then explained some experiments which he had made upon the magnetic field produced by a charged condenser moving through space, and mentioned certain views as to the nature of dielectrics.

Sir J. J. Thomson did not see what kind of idea about a dielectric could give positive results. If a moving charge and the detector were moving with the same velocity, no result would be obtained; there must be relative motion between them.

Prof. Trouton congratulated Mr. Swann on renewing the chase after that shy substance, the ether. It required considerable courage to carry on these difficult experiments, which, although they seemed outside the realms of useful investigation, opened up visions of limitless supplies of energy. It was the duty of physicists to leave no stone unturned in this matter.

Prof. Conway thought the experiments were justified, as being confirmatory of results which could be predicted.

Mr. Swann briefly replied, agreeing with Sir Joseph Thomson that one could not formulate any other view, and with Prof. Conway that the confirmation of hypothetical views which had been obtained justified the experiments.

Mr. V. E. Pound wrote a paper, which was presented by Prof. McLennan, entitled "On the Secondary Radiation from Carbon at Low Temperatures." Curves were given showing the charge gained, by the electrometer used for measuring, at various temperatures and in the presence of various gases. At the temperature of liquid air the secondary radiation from carbon was 1½ times that at ordinary temperatures. In the case of palladium the radiation at ordinary temperatures was twice or three times what it was at the temperature of liquid air. Further results were foreshadowed.

Dr. H. Stanley Allen then read his paper on "Photo-Electric Fatigue," an abstract of which has already been published in the Electrical Review.

Sir Joseph Thomson said that no doubt gaseous layers played the most important part; there was, however, more than one cause of photo-electric fatigue. If oxidisation occurred, fatigue was certainly produced. Measurements of the potential attained under ultra-violet light showed that the surface layers mattered a great deal. They were very difficult to remove, even in vacuo, and it was possible that they were re-formed by gas from the metal. When surface layers were involved, subjects became perplexing. Some of the results in contact electricity were due to it. "If a quiet life is desired," concluded Sir Joseph, "do not begin experiments where these films are concerned. They are only detected when the experiment is spoiled."

Prof. Crowther said that he had reduced the Hallwachs effect in four days to 7 per cent. of its original value, by interfering with surface layers, in the case of copper.

Dr. Walter Makower, of Manchester University, presented a paper by himself, Dr. S. Russ and Mr. E. J. Evans, on "The Recoil of Radium B from Radium A."

Heat-Insulating Materials.

In a paper read before Section G by Mr. F. Bacon on "The Testing of Heat-Insulating Materials," particulars are given of a series of tests carried out on various substances, with the aid of improved electrical methods. A Schniewindt flat resistance net, sandwiched between two flat slabs of the substance under test, served as the heating element, and the temperatures of the faces of the slabs, both inside and out, were measured with flat copper resistance coils wound on the faces of zinc plates.

The data were obtained for use in connection with cold-storage construction; some of the results are given below, and may be of use in various relations:—

Material.	Specific gravity.	Coefficient of heat conductivity at 50° to 75° C.
Yellow pine across grain	0·360	0·13
Teak across grain	0·515	0·23
Expansit Schrot No. I	0·051	0·055
" " No. II	0·049	0·061
Compressed cork slabs	0·166	0·060
Silicate cotton or slag wool	0·330 0·256 0·141 0·113	Mean value 0·07
Asbestos sheet, ½ in. thick	1·240	0·25
" millboard, ¾ in. thick	1·075	0·14 to 0·1
Air jacket in the vertical plane, 1 in. wide, walls of asbestos millboard	—	0·26 to 0·31

The Wimperis Accelerometer.

In Section G, Mr. H. E. Wimperis read a paper on the use of an accelerometer in the measurement of road resistance and horse-power. The accelerometer has already been briefly described in our pages; it is compensated so as to record acceleration in one direction only—that in which the vehicle is moving—and correctly indicates the rate of acceleration, both on the level and on gradients. In addition, when the vehicle is standing or moving at uniform speed on a gradient, the instrument indicates the grade. In the paper the theory of the accelerometer is explained, and numerous tables and curves are given showing the results of tests carried out on motor cars, &c., on roads of varying character.

Some of the measurements of road resistance obtained are given below:—

TABLE I.

Nature and condition of road.	Coasting resistance (declutched), lb. per ton.	Approximate speed, M.P.H.	Nature of motor vehicle.	Tires.
Tar macadam, hard	65	10	Motor wagon, total weight loaded, 4·3 tons	Steel behind, solid rubber in front
Ditto, soft and cut-up	140	10	Ditto	Ditto
Granite setts	50	10	Ditto	Ditto
Hard, dry main road	73	15	Heavy touring car, total weight loaded, 2·25 tons	Solid rubber
Half-rolled road metal	150	15	Ditto	Ditto
Clean wood pavement with tram lines	70	10	Motor wagon, total weight loaded, 4·35 tons	Ditto
Tar macadam, dry and hard	70	10	Ditto	Ditto
Ditto, very muddy and sticky	95	10	Ditto	Ditto
Road metal, partly rolled	120	10	Ditto	Ditto
Ditto, unrolled	200	10	Ditto	Ditto

TABLE II.—Coasting Resistance at Various Speeds on Heavy Touring Car Fitted with Solid Rubber Tires.

Total weight loaded, 2·25 tons. Car fitted with fixed canopy, glass screen and side curtains. Engine speed at 20 M.P.H. = 970 R.P.M. Tests taken against a slight head wind. Roads good and hard.

Speed, M.P.H.	Coasting resistance in lb. per ton.		
	Ignition off.	Clutch out.	Neutral gear.
5	60	50	46
10	71	59	53
15	87	73	63
20	111	92	76
22	122	101	82
25	—	118	92
30	—	—	112

The rise of resistance at higher speeds, due largely to the growing importance of air resistance, is very noticeable.

The accelerometer can be applied to measure the road resistance, air resistance, brake horse-power of the engine or motor, &c., and to analyse the losses of power in the various parts of the mechanism. It should therefore be of considerable use to electric tramway, railway, and electromobile engineers.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Special Fittings.

Messrs. Tetley & Co., of Falcon Electrical Works, Greengate, Salford, have recently made a specially designed fitting containing four 400-C.P. lamps, for a foreign government. This is shown in fig. 1. The fitting and reflector are cast in one part, and have two

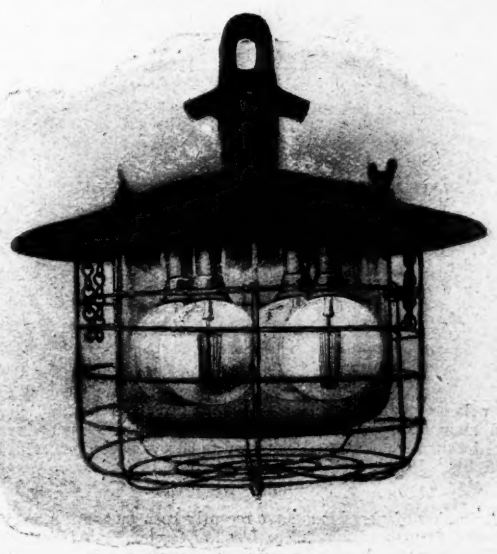


Fig. 1.—Special Tetley Fitting.

specially arranged rings for holding the well-glass, which is suspended by four chains; the diameter of the glass is 22 in. Messrs. Tetley stock practically all types of fittings to take from one 16-C.P. lamp to four 600-C.P. In a recently issued leaflet Messrs. Tetley describe their "Star" switch and fuse combined, which are interlocking.

Ward & Goldstone's Holders and Lamps.

Messrs. Ward & Goldstone, of Springfield Lane, Salford, are introducing several new lines in electrical accessories. One of these is the latest type of their Board of Trade pendant lampholder (fig. 2). This holder totally insulates the lampholder, and is made up of moulded fireproof material. In appearance the holder is very neat. The material appears like polished ebonite, but fireproofness and a very high insulation are the special qualities claimed by the makers, who, we understand, had so great a difficulty in meeting the demand for this holder that they have had to lay down increased plant, which now prevents delay.

The firm have also brought out a new type of Board of Trade hand-lamp known as the "Challenge" (fig. 3). This is not intended to supersede their well-known "Guardian" hand-lamp, but is introduced to serve for domestic purposes in private houses, where there is not the necessity for so heavy a type as the "Guardian." In appearance the "Challenge" hand-lamp is neat, as no metal parts

of the lampholder are in view, and the lamp cap is equally well insulated; it is claimed to be perfectly safe. Fig 4. illustrates the "Volex" policeman's lamp (4 in. high × 2½ in. wide), which is

Fig. 2.—Ward & Goldstone's Insulated Lampholder.

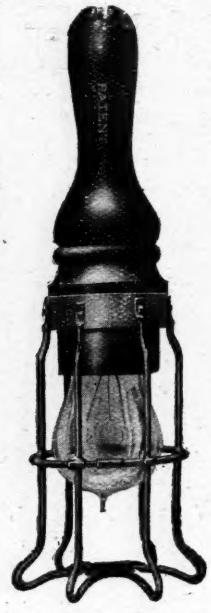


Fig. 3.—"Challenge" Hand Lamp.

fitted with the "Multum" dry accumulator, which Messrs. Ward and Goldstone have been supplying for the last four years. It is suitable for a watchman's hand-lamp, though originally designed

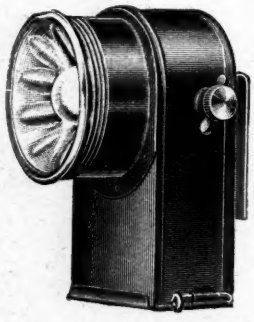


Fig. 4.—"Volex" Policeman's Lamp.

for policemen's use. It is also useful for meter-reading purposes, and many other uses that will occur to the reader. Fitted with a 2½-in. diameter lens, it is claimed to throw a very powerful beam of light.

Siemens' Novelties.

A number of new items have recently been put on the market by Messrs. Siemens Bros. & Co., Ltd., of Caxton House, Westminster, S.W. Amongst these is a series of electric motor sirens, one of

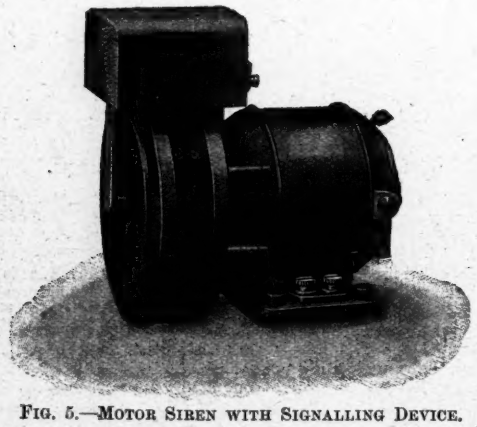


Fig. 5.—Motor Siren with Signalling Device.

which we illustrate herewith. These sirens give a loud and penetrating signal of a distinctive character, and are suitable for use in noisy places, such as engineering works, mills, &c., and where a large area must be covered, as in the case of a fire-alarm signal in a small town. The siren illustrated is in addition provided with an electromagnetic device mounted in a protecting case, which operates a disk over the air inlet of the siren; the winding of the magnet is connected in series with the motor, so that the armature of the

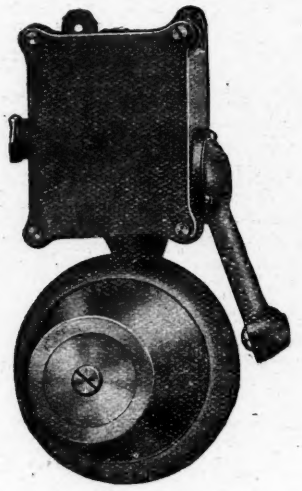


Fig. 6.—Siemens Watertight Bell.

magnet is attracted and the sound emitted only while the current is on. Thus the sounds are sharply defined, and can be given in accordance with any prearranged code to distinguish one signal from another. The motor is totally enclosed, and is rated at ⅛ H.P. for intermittent running. Larger sirens are also made, with weather-proof cases and with either D.C. or A.C. motors.

Another line is a variety of electric bells, including, besides the usual types, a number of watertight patterns; one of the latter is shown in fig. 6. This is provided with a cast-iron case, with a guard over the hammer and a watertight cable inlet; the gong, in this instance of the church-bell type, is of bronze. These bells are

Fig. 7.—Ribbed Strip for Stannos Wiring.

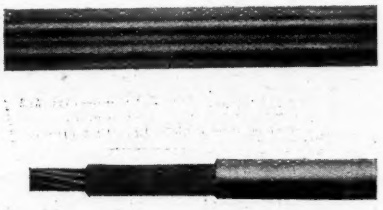


Fig. 8.—Stannos Wire with Heavy Sheathing.

wound for 6, 9, 110 and 220 volts. In Catalogue No. 528 numerous other patterns of bells, as well as pushes, indicators, &c., are detailed.

The remaining illustrations relate to new developments of the well-known O.S. wiring system. In a new list (No. 517, Sec. 1) just

Fig. 9.—"Cushion" Clips.

issued, attention is drawn to the advantages offered by the "Stannos" system, with its waterproof tinned copper sheathing, not only for interior wiring, but also for outdoor uses, and for wiring to motors. A series of Stannos wires with heavy sheathing,, and including larger conductors, has been brought out for wiring ships, railway coaches, &c., where the conditions are more severe than in ordinary applications; a 7/16 conductor of this class is shown in fig. 8, and a new device called the cushion clip, which is provided with a roll of metal to protect the wires from blows of the hammer, and to seat the head of the nail, in fig. 9. In conjunction with the last-named device a ribbed strip (fig. 7) is used to secure a number of wires at a time, as shown in fig. 10. Adapters to enable the Stannos system to be combined with the "Kalkos" and steel conduit systems are also available.

A neat series of Stannos watertight joint boxes has been devised, with little soft-metal channels for making the joints in the conductors. The channels have projecting nibs which are bent over the wires, and the whole is soldered together, and insulated from the box with porcelain linings; the box is then soldered to the sheathing, and after the gases have escaped through a hole provided

in the cover a screw is inserted into the hole, making the box watertight. Stannos fuseboards in which the "Zed" fuse is employed give an indication of the introduction of improved methods into fuse practice in this country, and remind us that it is never too late to mend our ways. An earthing clip of tinned copper suitable for bolting to the continuity bus-bars of a fuseboard, or for earthing the sheathing in other situations, is illustrated in fig. 11. We have already described the Stannos house fuse box; a useful addition to this class of fitting has now been

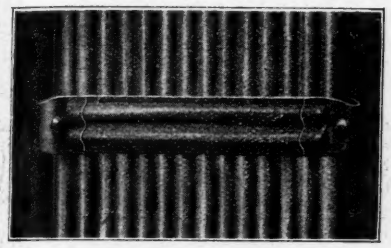


Fig. 10.—Stannos Wires Secured with Ribbed Strip and Cushion Clips.

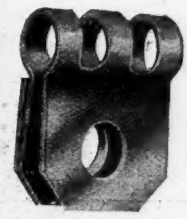


Fig. 11.—Stannos Earthing Clip.

made in the shape of the Stannos house service box. This is intended to facilitate the feeding of a row of houses from a single service, so as to secure that cheapening of house services which is so much to be desired in these days. The box is of galvanised cast-iron, designed for bolting to a wall, and is suitable for supply cables up to 0·05 sq. in., and for Stannos wires up to 7/16 S.W.G. Details of its construction will be given in a later issue. Numerous other accessories are described in the list, which also contains instructions for erection on the Stannos system.

Monorail Electric Hoisting Appliances.

The many advantages of handling materials by means of electric runways are now sufficiently appreciated to make a complete specification of their possible uses unnecessary; as, whenever quantities of material of any description require to be lifted and transported in bulk, they undoubtedly effect great savings over any other method. The following is a short description of the latest design of Witton Kramer monorail electric hoists, which embody several novel features. Fig. 12 shows an electric suspension hoist arranged

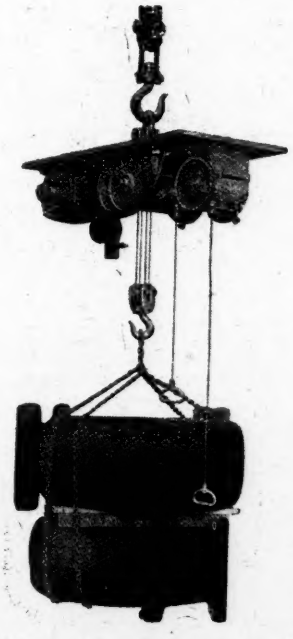


Fig. 12.—Witton Kramer Suspension Hoist.

for suspension from existing crane hooks or beams. The hoisting motion consists of a motor driving, by means of a high-speed chain drive and several sets of machine-cut spur gear, a machined drum. These parts are fitted to a steel top plate, which also carries a suspension link. The motor spindle is extended at the commutator end to carry a flanged pulley on which an electromagnetic brake operates. This brake is of special design, so arranged that when the current is switched on the motor, the solenoid is operated, pulling the brake shoes open, and as soon as the supply ceases for any reason, a strong spring pushes the shoes back into their "on" position, thus holding the load securely.

The load is lifted on two steel wire ropes, but a small rope pulley is fitted, so that, if desired, twice the load can be lifted at half the lifting speed by looping the ropes over this pulley, the load thus being raised on four ropes instead of two. The control is effected by means of a drum reversible-type crane controller fitted with suitable grid resistances, the controller being operated by means of a pendant cord and labelled handles.

To prevent any possibility of the load over-running through the operator failing to switch off in time, an automatic self-replacing over-winding switch is fitted, operated by the hook when it reaches the top position.

Special attention has been paid to the provision of a rope-guiding device to prevent the load leaving the drums in the case of side pulls. This rope-guiding device consists of two guides running on a screwed spindle, which is driven by means of a set of spur-gear from the spur-wheel fitted to the drum.

Fig. 13 shows an electric power travelling hoist, the hoisting gear of which is arranged generally in a similar manner to that of the suspension hoist described above, but the top plate is extended to carry a second motor which drives through a chain drive and spur-gearing four travelling rollers, made suitable for the under flange

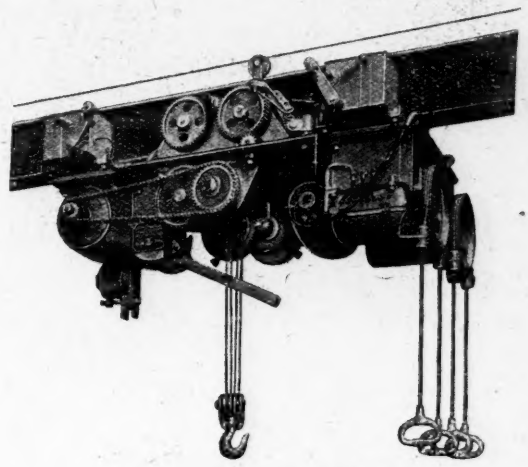


Fig. 13.—Power Travelling Hoist.

of "I" section R.S.J. A second controller is also fitted to operate this motor, and to the top plate of the hoist two automatic self-replacing over-travel switches are fitted to prevent the hoist over-travelling in either direction.

The current is brought to the hoist through suitable current collectors, receiving the current from bare copper trolley wires strained alongside the girder. The current collectors are of special design, so arranged that they can swivel in any direction.

These hoists can be arranged to travel round curves of not less than 8 ft. radius, and they can also be supplied when desired with controllers arranged for fixing against a wall, operated by crank handle in the ordinary manner.

In addition to the two types illustrated, hoists are made for travelling by means of a handle-bar arrangement, the handle bar being pushed in a similar manner to that of a truck. The electric power travel types are also supplied with a cab fitted to the top plate, this cab containing a seat for the operator and the necessary controllers and resistances. They are constructed for direct or alternating polyphase circuits, in sizes from 3 cwt. to 4 tons.

Skefko Ball-Bearings.

We have received from the Skefko Ball Bearing Co., Ltd. Carlton House, Lower Regent Street, S.W., samples of their bearings, which are the invention of a Swedish engineer, Mr. Sven

Fig. 14.—"Skefko" Radial Bearing.

Fig. 15.—Interior of Bearing Turned in Seat.

Wingquist, and are of very ingenious construction. They are self-contained, and cannot fall to pieces when taken apart—an easy operation; they are also self-aligning—a novel feature. The

accompanying section, fig. 16, indicates how these results are attained. The balls in a radial bearing (fig. 14) are carried in a one-piece phosphor-bronze cage, into which they are sprung by slight pressure, so that they cannot fall apart and be lost; the outer race is ground to a spherical surface, and the inner race is provided with two grooves of slightly larger radius than the balls. The latter are in two rows, slightly interlacing. The centre portion, consisting of the inner race, balls and cage, cannot fall out of the

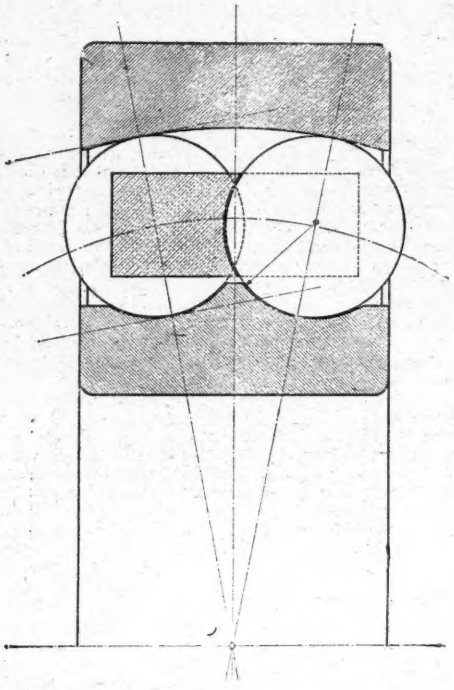


Fig. 16.—Section of Skefko Bearing.

outer ball-race, though it can be turned round, as shown in fig. 15; in this position it is easy to remove two adjacent balls, after which the centre portion can readily be withdrawn. The outer spherical race does not tend to jam the balls together, as might be supposed; the pressure is transmitted in a radial direction, passing through the centre of the bearing, as indicated on the section, and the spherical shape of the outer race provides the perfect self-aligning property above mentioned. At the

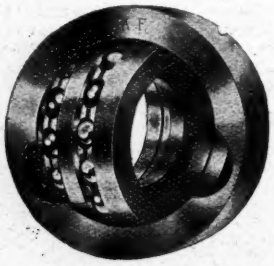


Fig. 17.—Self-Contained Double Thrust Bearing.

same time, end-movement of the shaft is prevented. The balls and races are of the best crucible cast steel, accurately ground to shape, and twice the usual number of balls are employed in each bearing. Various modes of fixing the bearing on the shaft are arranged for, enabling the bearing to be readily applied to existing shafting, &c. Single and double thrust bearings are also made; we illustrate one of the latter in fig. 17, which shows the central portion turned round at right angles to its spherical seating, and the two recesses in the latter which enable the component parts of the centre to be removed one by one, and as easily replaced, with no other tools but the fingers. Details are given of the various patterns and sizes of the bearings, which are standardised from ½ in. to upwards of 4 in. shaft diameter, in a catalogue just issued.

Adjustable Time-Limit.

An ingenious device has recently been patented and placed on the market by Mr. G. Ellison, of Victoria Works, 17 and 18, Warstone Lane, Birmingham. It consists of a simple time-limit device for circuit-breakers, which can readily be adjusted for any period from 10 minutes to zero, and possesses the "inverse time element" characteristic in that the delay is diminished in proportion as the overload increases, the release on a heavy short being instantaneous. Fig. 18 shows the complete circuit-breaker with the adjustable time-lag attached below; a section of the latter is given in fig. 19, from which it will be seen that a dash-pot is used containing thin oil. The periphery of the piston is slightly tapered, and the bore of the piston is of corresponding taper, so that by screwing the cylinder up or down a closer or looser fit results, and thus the time-lag can be varied, the screw A being used to lock the cylinder in the position giving the desired retardation. The

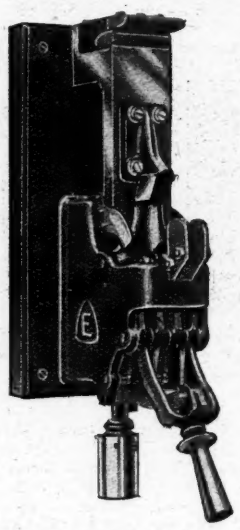


Fig. 18.—Circuit-Breaker with Adjustable Time-Limit Device.

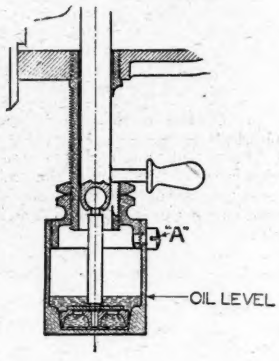


Fig. 19.—Section of Time-Limit Device.

cylinder is provided with a series of holes corresponding to definite time-lags, each of which can be brought into coincidence with the tapped hole for the insertion of the screw. The device retards the plunger over a distance of only about ½ in., then leaving it free to move up quickly and deliver the necessary hammer-blow to the retaining hook of the breaker. The time-lag can be fitted to almost any make of circuit-breaker, and can be had separately for that purpose. It is free from creeping, sticking and other troubles, and appears to give promise of excellent results.

PROCEEDINGS OF INSTITUTIONS.

Electric Steel Refining.

By D. F. Campbell (London).

(*Abstract of paper read before the* Iron and Steel Institute, *September*, 1910.)

The refining of steel that had been previously melted was the first use to which the electric furnace was applied commercially; but now that single furnaces have been producing over 200 tons a day for more than 16 months, it is obvious that the field for the process has widened, and already many furnaces are in construction or operation in this country. The electric furnace is especially suitable, and will be widely adopted, for any class of work in which raw materials of a high degree of purity are now used.

A wider application for rails and sections may occur when working in connection with the Talbot furnace, for the charge can be taken to the electric furnace as soon as the carbon is down, and the necessity of removing the sulphur and getting a teeming heat is avoided, as this is done in the electric furnace both economically and completely. Thus the capacity of the Talbot furnace is substantially increased, and this covers the greater cost of electric refining.

Again, in the case of a basic open-hearth plant, using 60 per cent. of molten pig iron and 40 per cent. of scrap, a 40-ton furnace might have 15 tons removed to the electric furnace for refining, and a similar charge put in, every two hours. Thus the capacity would be increased, the quality improved, and, in addition, a reduction in the cost of raw materials can also be made in some cases, as a low quality of pig iron can be used.

Similar conditions occur when working in conjunction with an open-hearth plant for making castings, and a thoroughly dead melt and extreme fluidity can be obtained, while the commonest raw materials can be used, and refined completely. Even in the case of foundries engaged in ordinary open-hearth casting work, in which the margin of profit is now exceedingly small, the electric furnace is considered necessary for an improvement in quality, while in a small foundry making light and intricate castings from crucible steel, an economy of several pounds per ton may be expected to result from the adoption of the electric furnace, judging from the reduction of the costs in works in Germany, where crucible furnaces were replaced by this process.

There is little doubt that crucible steel, Swedish billets, and products of intermediate quality, such as are used for the Sheffield

trade and by tube-makers of Staffordshire and South Wales, can be economically replaced by steel refined by electricity, and made in Middlesbrough, Cumberland, or the larger steelworks in the Sheffield and Rotherham districts.

The use of the electric furnace is not likely to become general for rail steel manufacture at the present time, except in cases where the conditions are exceptional. In certain cases, such as at South Chicago, it has been adopted for that purpose owing to the economic conditions, notably the scarcity of good Bessemer ores and the demand for better rails.

In the electric furnace, almost any degree of refining can be economically effected, and the removal of sulphur, phosphorus and oxygen is especially easy. This is probably due to at least three causes :—

1. The intense heating and the extreme fluidity of the slag, which is the place at which refining takes place.

2. The extremely basic slag that can be kept in a very fluid state, and the calcium carbide formed by the action of the arc on the calcareous slag, are especially advantageous for desulphurisation.

3. The violent motion of the steel, which results from the convection currents produced in the bath, due to the two intensely hot areas caused by the arcs below the electrodes, increases the volume of steel exposed to the hot and fluid slag area, and hence the rate of refining.

The usual procedure for the use of the electric furnace in connection with the Bessemer converter is to charge the steel, holding back all slag in the ladle, after putting on the bottom of the furnace lime and mill scale or iron ore. This produces an oxidising or dephosphorising slag, which may be carefully skimmed or poured off. On the bath of steel, carbon is thrown to carburise to any required degree, and then a second highly basic and desulphurising slag is added. The arc acting on the calcareous slag produces calcium carbide, which may combine with sulphur to form calcium sulphide. As neither gases nor air enter the furnace, and the conditions are almost completely reducing, no sulphates are formed, a dead melt is easily obtained, and when the slag is molten and the requisite heat obtained, the steel is teemed. In the open-hearth or any oxidising furnace these reactions cannot take place so completely and efficiently.

With steel from the basic open-hearth furnace the procedure is similar, but when the quantity of phosphorus to be removed is small, it is only necessary to use one refining slag for the elimination of sulphur and any small amount of phosphorus remaining. The usual practice is to put the carbon necessary for carburising in the bottom of the furnace, and then add the steel and the basic slag materials. As soon as the teeming heat is obtained, the necessary ferro-alloys are added, and the steel will be completely refined.

Another point of interest is the rarity of blow-holes in electric steel when properly made. In electric steel oxides do not occur in any quantity, and consequently the prime cause of blow-holes is reduced.

Again, the quality of electrically refined steel is better than a material of similar chemical composition made in any oxidising furnace. This is probably due to the reducing conditions under which it is finished.

It must not be forgotten that the electric, just as much as any other furnace, requires trained men, and most careful designing by metallurgists who have made a special study and had practical experience in this subject.

The question of the cost of applying this process, which must be considered before all others, is more difficult to discuss generally, owing to the great variety of conditions. The following are the chief points, all of which must be carefully considered in each particular case :—

1. The possibility of saving in cost of raw materials, since the best qualities of steel can be made from impure raw materials.

2. Possibility of increasing the output of present furnaces by the addition of electric furnaces with improvement of product.

3. The cost of power and possibility of using blast-furnace or coke-oven gas, exhaust steam, &c., will be the determining factor in regard to deciding whether, in the manufacture of steel, electric refining can be economically adopted. In the case of cheap power or valuable products, scrap may be economically melted and refined in the electric furnace at a current consumption of 700 to to 800 KW.-hours per ton, or if the price of power be high, the steel may be merely desulphurised and deoxidised, after melting and dephosphorising in a basic furnace, with a power consumption of 100 to 150 KW.-hours per ton.

4. The possible reduction of capital expenditure at certain works where the present products are not sufficiently good for modern specifications.

The figures given are taken chiefly from Héroult furnaces in America, England, Germany, and France, as this type has been far more widely adopted, and is used in larger units than any other, and single furnaces are now refining 250 tons per day. This furnace is similar to a basic open-hearth furnace, and seems to present more simplicity and to embody more of the desirable features of electric furnace design than any other, which, in the author's opinion, are—

1. The best basic open-hearth design should be followed as closely as possible. A bottom homogeneous and solid, and banks free from embedded electrodes is important, and, above all, simplicity of design.

2. All electric mechanism, in the form of generators, transformers, &c., should be entirely separate from the furnace, should work under ordinary conditions of standard electrical practice, and should be of standard design, so as to avoid all unnecessary risks and complications.

3. A high power factor must be maintained, thus reducing the capital cost of machinery and increasing the general efficiency of the power-house.

4. To avoid excessive cost of refractory materials, the roof should be protected from the direct radiation of the arcs by the electrodes themselves, and the intensely heated area of slag should be as large as possible, to increase the surface of refining action. The Héroult furnace has an advantage over the open-hearth furnace in that the heat is applied to the centre of the bath, so that the banks are not quite so hot as the middle of the furnace, and the wear of refractories is consequently less.

5. The heat should be applied to the slag, as in the basic open-hearth furnace, and the temperature of the slag should be maintained above that of the steel, which allows of extreme basicity and fluidity being obtained and gives an intensely active refining action. The conditions in the furnace should be oxidising, neutral or reducing, at will.

As soon as the Sheffield steel-melter has become accustomed to the working of electric furnaces, electrically refined steel will largely replace ordinary crucible steel. This has already occurred in Germany and America, where electric furnaces are used to make all classes of special and high-speed steels, the usual practice being to refine metal from a basic open-hearth furnace. Large crucible plants and small open-hearth furnaces engaged in the manufacture of small and intricate castings, such as motor-car parts, &c., may be replaced by electric furnaces, because the high degree of fluidity and dead melt obtained is especially advantageous.

In many cases manufacturers of axles, guns and tubes, will abandon the use of Swedish raw materials and refine steel made from low-grade ores ; by the use of electricity Cleveland stone will produce a steel equal to the best hæmatite ores.

From the electrical engineer's point of view the electric furnace is an attractive load, as it is more or less in continuous operation. In the case of the Héroult furnace the power factor is 0·88 to 0·90, though much less with large induction furnaces. Single, two or three-phase current of any frequency from 20 to 60 has been used without any difficulty, though it is preferable in the case of a two-phase system to transform to three-phase current. The load factor will be most favourable, the usual practice when refining, for example, in a 15-ton furnace, being to use 2,000 KW. for 20 minutes after charging, while the steel is being heated. The current is then reduced to about 1,500 KW. for 45 to 75 minutes until the steel is ready for teeming. There is then an interval of 10 to 15 minutes during which the furnace is teemed, fettled and charged, which allows the transformers or generators time to cool before the period of overload commences. Current fluctuations occur for a few minutes, while there is an evolution of gas from the steel which makes the bath boil up and touch the electrodes. This, however, is not sufficient to be objectionable, provided that the electrical machinery is properly designed for the purpose, and the extent of these variations is not so great as in the case of many rolling mills, the fluctuations in voltage being only about 3 per cent. in the South Chicago works, where a 2,000-KW. furnace has been working steadily since May, 1909.

The subject of electric steel refining is now receiving the attention of many steel-makers.

The discussion on Mr. Campbell's paper was opened by MR. E. H. SANITER, who expressed his strong belief in the future of the electric furnace, but issued a warning that that future was likely to be damaged by recommending the furnace for making comparatively cheap qualities of steel. The author might be right in asserting that the attachment of an electric furnace to a Talbot furnace would substantially increase the capacity of the latter, but Mr Saniter thought it would be more possible to heat steel in a Talbot furnace than in an electric furnace. Mr. Campbell had suggested that by taking out of a 40-ton basic furnace 15 tons every two hours, and putting it into an electric furnace, a big output would be obtained at a reduced cost. But 15 tons every two hours meant over 1,000 tons of steel per week, and unless Mr. Campbell was going to put it into the electric furnace in the form of steel, he did not see how he was going to gain much ; and even if he did put it in in the form of steel, how could he get that quantity out of a 40-ton furnace? He did not think that rails were likely to be manufactured by the electric furnace at the present time. It might be possible to save some materials by the use of the electric furnace in some special directions, but he did not think there was any possible saving in Cleveland pig or hæmatite. He also thought it was time they had some idea as to costs, instead of being told that so many kilowatts would do a certain amount of work. With regard to the desulphurising of the electric furnace, it had interested and amused him for the last few years to see the number of new theories ; as a matter of fact, they could do desulphurising without an electric furnace. He doubted whether the calcium carbide which was formed in the Héroult furnace had anything to do with the desulphurisation.

MR. LEON GREINER quoted statistics, showing that 35 induction and 77 electrode furnaces were actually working, or were being installed. Of the electrode furnaces, the Héroult headed the list with 29. The furnaces at South Chicago treated 15 tons of steel each, but they were fed with liquid steel coming from a Bessemer converter. At Enghien, in France, an entire electric steel works was installed, which comprised four furnaces of 2 tons and two furnaces of 15 tons on the Girod system.

MR. E. C. IBBOTSON said the steady load of the induction furnace was a great advantage from the electrical point of view. It had yet to be proved that the highest qualities of steel were produced from the electric furnace, and it was doubtful whether the Héroult furnace, with its intensely hot arcs, was going to affect seriously the high-carbon steels such as were produced in Sheffield.

MR. J. H. HEAP said they had to inquire whether the electric furnace gave a cheaper and more convenient form of heat than something else. The general idea was that the more fuel was used in the steel-making process, the better did electric smelting compete with that process. They had an expenditure of coke of 60s. to 70s. on a ton of steel produced. Against that they might reckon a consumption of 800 KW.-hrs. per ton of steel, which, at ½d. per unit, was equal to 33s. 4d. This left a great margin of difference, which was only slightly reduced by the cost of the electrodes, &c. With regard to pig iron, they had a consumption of 2,000 KW.-hours per ton of pig iron, or, at ½d. per unit, a cost of nearly 84s. a ton, and that could only replace a part of the coke, because they still must use the latter as a reducing agent. Between those two extremes they had intermediate stages at which the electric furnace could be economically introduced. In considering its application in place of crucibles, they must remember that they were limiting it to the conditions under which the crucibles were working. They were assuming that the electric furnace would be working with the same pure materials, whereas when they came to review the question all round, they recognised that it could start with cheaper materials. The electric furnace could not in this country follow up directly the blast furnace: there must be some intermediate handling of the pig-iron, which could be done by a more economical method. But the electric furnace could intervene between the final stage at which the open-hearth furnace left the steel. For instance, an obvious application for the electric furnace was the taking of a common Bessemer steel, starting purposely with the cheapest materials, and refining that steel. He would like Mr. Campbell to give analyses of some of the finished steels made during the last three months at South Chicago works. Every steel manufacturer found a difficulty in comparing the statements of the merits of various electric furnaces and deciding which one he should adopt.

MR. F. ROWLANDS said it was not correct to say that the South Chicago works had adopted the Héroult furnace; they were only experimenting with it. He should like to know what the costs were for electrodes in the large-size furnace, as he understood there had been a great deal of trouble with the carbon electrodes, and graphite electrodes had to be used, costing 15s. to 16s. per lb. The intense heating of the slag must be detrimental to the roof of the furnace, and he did not think that any special virtue could be claimed in having the edges of the bath cold. Mr. Campbell stated that the load factor only fluctuated to the extent of 3 per cent. at the South Chicago works. If that fluctuation applied all over the works it was a considerable item, because a large amount of power was used there. He had tried to take readings on the Héroult furnace, and had found that the fluctuations while the refining was going on were anything from 150 KW. to 270 KW. in a small furnace.

MR. F. W. HARBORD thought that the author had laid down fairly well the economic limitations to the use of electric furnaces. The latter could clearly compete with the crucible furnace, and the only question was whether the quality was equal to that which was made in the crucible. He thought it must now be admitted that for practical purposes that was so. There might be some special classes of steel which could only be produced from very carefully selected materials melted in the crucible; but, broadly speaking, for 90 per cent. of the purposes for which tool steel was required, electric steel met all the conditions complied with by any of the well-known furnaces. There was a great opening for electric furnaces for axles and tires. The electric furnace was an expensive melter but an economic refiner at high temperatures. For common classes of steel, such as rail steel, it was less economical to heat steel in an electric furnace than in the open hearth. But when they were required to produce a high-class steel the electric furnace came in, as it provided finishing conditions which could be obtained in no other way. He had come to the conclusion that the electric furnace was only useful economically on moderately priced materials where they required to finish with a very low sulphur and phosphorus content, for which engineers were prepared to pay a high price. It might in some special cases be used for rail steel, but, generally, it would not be so, because engineers would not pay the extra cost for their rail steel.

MR. CAMPBELL, in the course of his reply, said he did not think that the electric furnace was going to be used to a very large extent for rails, but in a works where a lot of railway material was made it was probable that a great deal of steel for making axles and tires, and so on, would be treated in the electric furnace. It had been suggested that the electric furnace at South Chicago was an experimental one; that might be true as regards rails, but it was used largely for axles and tires and for casting. He did not think that the electric furnace would entirely replace the crucible; there were special cases where the latter would always hold its own. Mr. Heap thought the amount of power used at South Chicago was over 200 KW.-hours per ton, but he (Mr. Campbell) said that in the case of material which was fairly low in phosphorus, the average was 111 KW.-hours; where two slags were removed, it was 177 KW.-hours per ton.

AN ELECTRICAL APPARATUS FOR DETECTING COLLIERY FIRE-DAMP.

A VERY interesting piece of apparatus designed to detect the presence of fire-damp, or marsh gas, in colliery workings, has been placed on view in the showrooms of Mr. Parmley Graham, of Newcastle-on-Tyne, by one of the firms for which he acts as selling agent—Messrs. J. H. Holmes & Co., of Newcastle-on-Tyne. It will be remembered that fire-damp is a gaseous mixture which contains a considerable amount of hydrogen, and the apparatus takes advantage of the fact that platinum rises in temperature in the presence of this gas. Fig. 2 gives the general appearance of the component parts of this apparatus, the upper portion of the illustration showing the cut-out enclosed in a cast-iron box, which is usually mounted on the panel containing the motor switchgear. The detector itself, shown in the lower half of the illustration, is placed at any distance from the cut-out in such a position that it can quickly detect the presence of fire-damp in the vicinity of the electrical apparatus which it is designed to protect. The detector box takes up very little room, being about 12 in. long, 3 in. wide and 3 in. deep, and is closed from interference, as shown, by a Yale lock or other means. It is provided with openings covered with fine wire gauze similar to that used in safety lamps, in order to allow the gas to penetrate quite freely.

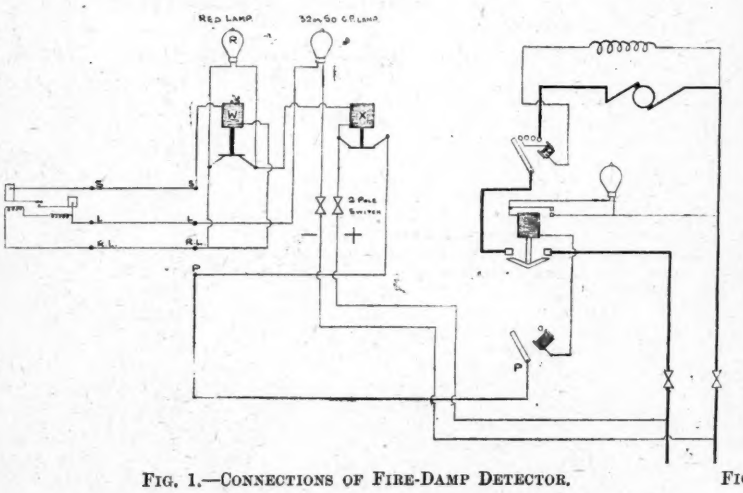


FIG. 1.—CONNECTIONS OF FIRE-DAMP DETECTOR.

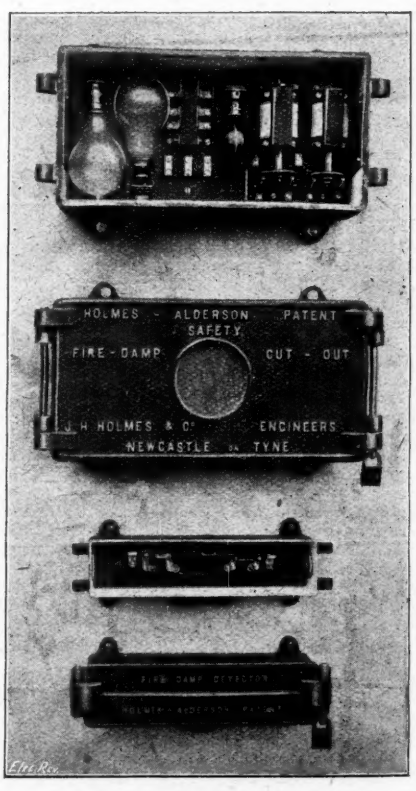


FIG. 2.—HOLMES-ALDERSON FIRE-DAMP DETECTOR.

Fig. 1 shows diagrammatically the arrangement of the apparatus. The detector itself is formed of two strips of metal, shown at the

extreme left of the diagram, each rigidly fixed at one end, and the free ends of which overlap. Under normal conditions these remain out of contact with one another. Each strip consists of two pieces of dissimilar metal, such as steel and brass, having different coefficients of expansion, and any heating of these strips causes them to curve. Below the strips are placed coils of thin wire, that on the left being composed of some metal having no catalytic properties, and that on the right being made of platinum; these coils are placed in series, in a circuit passing to a lamp or resistance in the cut-out box. So long as there is no hydrogen present, the heat evolved by each coil is equal, and is transmitted to the metal strips above the coils, which curve upward equally and do not come into contact with one another; hence variations in atmospheric temperature or voltage of supply do not upset the arrangement. If, however, fire-damp is present, the temperature of the platinum coil increases, and the strip above it curves to a greater extent and makes contact with the overlapping strip. When this occurs, current passes through the circuit S S to the magnetic solenoid switch W, lifting the core of this switch and breaking circuit on two springs shown. This causes the red lamp R to be put in series with the 32 or 50-C.P. lamp shown and the heating coils. The red lamp lights up brilliantly, giving a danger signal, while the current passing through the white lamp and the heating coils is so much reduced that the white lamp goes practically out and the heating coils cool down. By putting this red lamp into series, it will be seen also that the current in a second magnetic solenoid switch X is also reduced and the core of this second switch falls, breaking connection in a circuit passing to the starting switch of any motor which it is desired to cut off in the presence of fire-damp. In the arrangements shown in the diagram the reduction of current in X breaks the circuit of the main solenoid switch controlling the motor, and the switch therefore flies to its off position, thus cutting off the supply. If the motor solenoid switch be enclosed in a locked case an attendant, however foolish, cannot possibly switch current on again under gassy conditions until the solenoid switch W has been reset by a person having the key giving him access to the same.

Further reference to the diagram will show that the fire-damp cut-out is connected to the supply mains on the supply side of the main double-pole switch controlling the motor circuit which it is desired to protect, so that it is always capable of operation. In this way this protective device is not put out of action at times when the motor switch is off, as, for example, during week-ends; and this is important, because the accumulation of gas during such periods is extremely probable, and it is desirable that such an apparatus should prevent the starting of the motor under gassy conditions when work is resumed. It will be seen that between the cut-out box, which may be conveniently placed near the motor control and the detector itself, there are only three small wires, so that the problem of installation is a very simple one, and the repair and renewal bill for this apparatus is very small, inasmuch as it is as easy to replace a heating coil as it is to put an ordinary lamp into a holder. The indicator lamps burn at less than their rated voltage, and therefore have an indefinitely long life. A switch is provided in the detector to short-circuit one of the heating coils, so that at suitable periods the apparatus can be tested to see that it is in working order. In addition, a two-pole switch is provided in the cut-out box to render everything dead within it and the detector box if this is required at any time.

At the present time, in view of the outcry which has been raised concerning the safety of electrical machinery in collieries, and the Home Office inquiries on the subject, it is superfluous to elaborate the fact that electrical machinery, especially direct-current commutating plant and all switchgear, has to be very carefully guarded in order to prevent electric sparks from igniting explosive mixtures of air and gas in the mine, and, in view of the large amount of electric power used in collieries, it is of prime importance to install safety appliances of the nature described, to minimise dangers from explosion, and to give, in addition, visible and audible notice of the presence of noxious gases. The Holmes-Alderson apparatus, for which an application for a patent has been made, can be adapted for giving an indication at any desired point that gas is present at the place where the detector is situated. This signal can be made by either lighting a lamp or ringing a bell. The function, however, for which the apparatus will probably be most used, will be to entirely cut off the electrical current from motors or other electrical plant as soon as, or before, a dangerous percentage is reached, inasmuch as the sensitiveness of the apparatus can be, if necessary, made such that it will operate on 2 per cent. of fire-damp.

Total enclosure of a motor increases the cost of the installation for a given horse-power to about double the cost as regards motors, while enclosed motors are very subject to depreciation and breakdown, owing to the difficulty of access to important parts and consequent risk of inattention. Beyond this is the consideration that in a good many parts of colliery equipment portability is very essential, and weight and size become important factors. It is claimed that the use of such a fire-damp cut-out allows of the employment of smaller, lighter, cheaper, and more easily accessible motors with an equal or greater degree of safety than with the system of total enclosure, and in addition it draws positive attention to the fact of the atmosphere needing purification at the earliest possible moment. This is important even if enclosed motors are used. The device also has the advantage that in the presence of danger no inexperienced person can start up the apparatus whose use might be dangerous. Hence it provides a means of automatic control as regards the operation of colliery plant in relation to the presence or otherwise of fire-damp, and for this reason it opens up a new sphere of work which should be of interest to electrical engineers in all countries and districts where colliery plant is installed.

BUSINESS NOTES.

British Electrical Manufactures Favoured in Japan.—The following information is from the report by H.M. Consul-General at Kobe (Mr. R. de B. Layard) on the trade of that district in 1909, which will shortly be issued:—

"The imports into Kobe under the heading of machinery decreased by 46 per cent., or over £670,000 (viz., from £1,469,004 in 1908 to £796,682 in 1909). In the imports of electrical machinery, the proportion of British to German and American goods has increased greatly. British electrical machinery is much esteemed by the Japanese, but the manufacturer has always the same difficulty to contend with in Japan, viz., that cheapness is likely to outweigh considerations of quality. In machinery of other kinds there has been a great diminution of imports, due principally to the general depression in business throughout the country. Many new electric light and tramway companies were started during 1909, to which cause the increase in the imports of electrical machinery is to be attributed, but the boom came to an end with the close of the year. Apparatus and machinery for gasworks have been imported from the United Kingdom to a very large extent, but it is not likely that this extensive importation will be maintained for more than a few years, a great deal of the plant required for such undertakings being now manufactured locally. Cheap machine tools are now being turned out in ever-increasing quantities by Japanese engineers, which presumably satisfy requirements, although the foreign importer is of the opinion that they are unsatisfactory. Experience will show which can command the market. The boom in electric light companies increased the demand for British-made electrical wires and cables, which are much preferred to those made in other countries, but once more the preference for cheapness before quality prevents larger sales. There are now many small cable manufacturing concerns working in Japan; only one of those concerns, however, competes in quality with the imported goods, and this one is equipped with British machinery and has the services of a British cable expert.

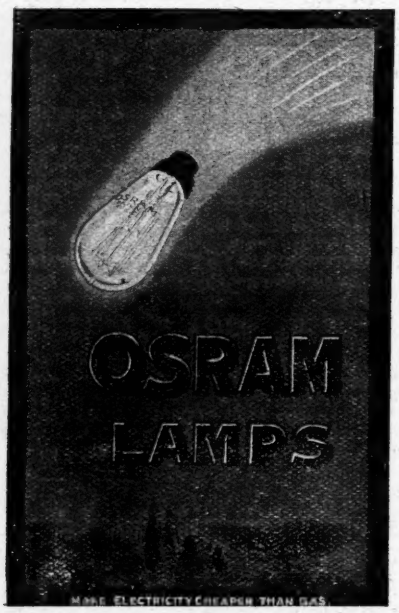
"In industrial enterprises the increase of electric railways and tramways, electric light and gas undertakings is remarkable. No special mention need be made, however, of these undertakings, as those foreign firms on the spot who supply machinery always keep themselves fully posted as to the requirements of the companies. These supply themselves by means of privately made contracts and not through public tenders."

The following information is from the report by H.M. Vice-Consul at Osaka (Mr. E. H. Holmes) on the trade of that district in 1909, which will shortly be issued:—"The manufacture of machinery of all kinds is extensively carried on at Osaka. There is a growing demand for motors of various kinds owing to the great increase in the use of motive power in the smaller factories. With the exception of the spinning and weaving industries, by far the greater part of the machinery used in the Osaka factories is of Japanese manufacture, the designs having been taken from foreign models; in this connection, the importance of taking out patents in Japan for any new machinery imported into the country cannot be too strongly impressed on British manufacturers."—*Board of Trade Journal.*

The Aluminium Industrial Situation.—It is considered in Continental circles that as an understanding has now been reached between the producers of carbide of calcium, this circumstance will render it easier to arrive at an agreement between the manufacturers of aluminium, as the makers of the former are also in part interested in the output of the latter article. It was recently reported that the demand on the part of consumers of aluminium have become brisk, and the price advanced from the beginning of the year. At the middle of last December the quotation had receded to about £60 per ton, but in the course of this year it rose to over £75 in consequence of the covering of active requirements, and a continuing good demand has also been experienced on the Continent from well employed consumers during the past few weeks. Nothwithstanding this fact, a weakening in the situation of prices has occurred down to £68 to £70, which is attributed in the first place to underselling by an English works, apparently for pursuing special interests. It is considered probable that the action of the English company, which is also exerting itself to sell aluminium in Germany, will render it easier to bring about an understanding between the leading Continental producers. It is announced in this connection that the Aluminium Industry Co., of Neuhausen, has decided to increase its share capital from £1,040,000, upon which half has been paid, to £1,248,000, and to offer the shares to existing shareholders at the price of £86 per share. The premium resulting from the emission is to serve the purpose of a further payment of 25 per cent. on the half-paid shares, instead of, as in Germany, being placed to the reserve fund.

Osram Lamp Publicity Campaign.—If publicity literature continues to come in at the rate it has been doing during the last week or two, the Electrical Review will be compelled to indulge in another extension of premises. Yet, though our walls do not permit of the effective display of all the good and striking things that this season of the year brings to us, unless we place them one over the other—which, of course, we do not like to do, for might not the designer of the first comer visit us when the last received was spread out in all its glory?—we are naturally greatly interested in the more than usually enterprising doings of the moment in this connection. The trade reader also has a direct

interest in these efforts of lamp-makers and others, for the more the public are familiarised with names and good qualities, the easier will it be for the factor and the contractor to sell, because minds are half made up, if not more, before buyer and seller meet. The publicity campaign of the GENERAL ELECTRIC CO., LTD., of Queen Victoria Street, E.C., for pushing the "Osram" lamp business is a very extensive one, as the literature and posters upon which we gaze just now prove. We have been irritated beyond measure for a long time past when travelling on one of the London suburban railways by a sign which glares out nightly "Gas is cheaper than electricity for all purposes." We have wished we were the tenant of the next building to get on the track of that terminological inexactitude or gross misrepresentation—call it lie if you will—by displaying a counter-sign. Such a counter-sign might appropriately be found in the G.E.C. Osram battle-cry, "Osram lamps make electricity cheaper than gas." The Osram advertising policy clearly is to teach the public, and as part of the scheme for doing this the G.E.C. advertisement department have produced an exceptionally striking poster measuring



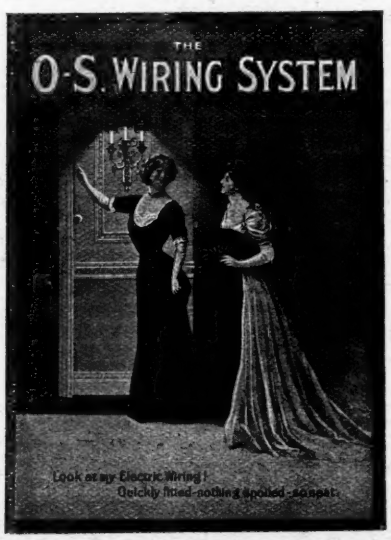
120 in. × 80 in., and printed in eight colours, which is now being (or is about to be) displayed in selected towns throughout the kingdom. Copies are also being offered to all contractors who would care to display same on their premises, with an additional slip to paste underneath, bearing the words "sold here." It is already to be found on the London Tube Railways in prominent positions, and has aroused a good deal of interest. An extensive press advertising scheme has, we understand, been organised to further assist in teaching the public that electricity can be made cheaper than gas. Whilst a full assortment of advertisement folders, price lists, picture post-cards, novelty cards, picture albums, leaflets, invoice forms, adhesive labels, show-cards, window bills, are offered to the trade, with contractor's name and address printed thereon free of charge. We understand that the General Electric Co. have another big Osram advertising surprise up their sleeves for development a little later. The present general scheme appears to be very complete, and admirable means of reaching the public have been included.

Catalogues and Lists.—MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—We have received a very large volume from this firm relating to their switchgear manufactures, transformers, and accessory apparatus. Although nominally it is their 1910 catalogue, those who receive it will at once recognise that it is much more than an ordinary trade catalogue. The indexing and paging have been carefully attended to. The work is sub-divided into seven sections, and a special index is inserted at the commencement of each section. In one or two cases, index charts have been introduced as the most convenient form for showing the position where any given type of apparatus can be most readily located. These should undoubtedly simplify the work of reference. Before mentioning the contents further, a reference should be made to the method for inserting or withdrawing the pamphlets. Brass screws are placed on the front of the cover, which are intended to be slackened by means of a coin (not a screwdriver), and the two halves of the binder forced apart; any additional pamphlet may then be inserted, or an existing one removed with ease. The compilers have incorporated in the book a large amount of important information which should prove particularly useful to engineers engaged in the installation of switchgear, transformers, &c., while all necessary data as regards prices of Ferranti manufactures are also given. A number of purely descriptive pamphlets are included; at the commencement, for instance, pamphlets appear dealing with the lay-out of the high-tension switchgear as supplied by the firm for the Glasgow Corporation; heavy continuous-current switchgear as supplied for the Manchester Corporation in connection with the very large storage battery recently installed, and so on. Elsewhere there are pamphlets devoted solely to technical matters, these having been, for the most part, specially written for inclusion in this volume. They include:—"Technical Considerations regarding Wattmeter and Power-Factor Measurements." "Ditto regarding the Use of Current Transformers and Potential Transformers in connection with Relays, Trip-coils, &c." "Technical Considerations regarding various Methods of Protection." This last-named covers the protection of generators, transformers, feeders, &c., explaining when to use overload time-limit relays; when to use reverse relays; when to use the Merz-Price current-balancing system, &c. There is a further pamphlet dealing with the use of electrostatic voltmeters as leakage indicators, and a reprint of a paper on high-tension switchgear, with special reference to colliery and mining work. Other pamphlets of interest deal with excess-pressure dischargers and electrically-operated circuit breakers. Messrs. Ferranti have built such breakers for dealing with currents of 15,000 amperes. Among the further contents to which allusion may be made, are full technical data relating to instruments, relays, trip-coils, &c., from which the necessary size of current and potential transformers can be determined for any combination of trip-coils, measuring instruments, relays, &c., with which they are desired to be used. Among the half-tone pictures, which are numerous, and, generally speaking, very finely executed, are some views of the different departments of the works. Line diagrams, too, have been included with a generous hand. A good quality glazed paper is used throughout. Undoubtedly the catalogue is one of the finest, as it is, we believe, the largest, of its kind that has passed through our hands. It reflects great credit upon all who have been engaged upon the various duties connected with its production, and has justly evoked praise for the enterprise of the firm which has at such great labour and cost cast bread upon the waters; may it not be many days before it returns a hundredfold.

MESSRS. JENS ORTEN-BOVING & CO., 9½, Union Court, Old Broad Street, London, E.C.—12-page illustrated pamphlet containing descriptive particulars, dimensions and prices of standard sizes of their Zodel-Voith patent flexible insulating couplings B.B. and Reich types.

MESSRS. CROMPTON & CO., LTD., Salisbury House, London Wall, E.C.—40-page catalogue (D 26) in their standard form and size, setting forth very full information regarding their enclosed continuous-current motors and dynamos, which are supplied in five different types, namely, protected, semi-enclosed, dust-proof, pipe-ventilated, and totally enclosed. Tabular particulars as to outputs, weights and shipping measurements and prices, occupy a number of pages and are plainly set out. The later pages are devoted to pulleys, fly-wheels, standard couplings, geared motors, field regulators, starters and series reversible crane motors.

MESSRS. SIEMENS BROS. & CO., LTD., Caxton House, Westminster.—In addition to Catalogue No. 517 of Stannos wires and fittings, which is noticed in our "New Devices" to-day, Messrs. Siemens Bros. & Co. have sent us a showcard, measuring 20 × 15 in., and



printed in colours, intended to bring home to the public the fact that the O.S. system means "house wiring without discomfort." We reproduce the design herewith; it is also got out in postcard form for the use of canvassers and contractors. Both showcards and postcards are at the disposal of contractors and others for business purposes.

MESSRS. MAWDSLEY'S, LTD., Zone Works, Dursley, Glos.—A large and handsome showcard has been issued which fulfils completely the main object of a showcard—it leaves an excellent impression upon the mind. It is intended to show that the firm makes dynamos and motors for all purposes, and the general design and beautifully printed illustrations express this very strongly. Little letterpress appears beyond the name, address, and cities at home and abroad where the business has its agencies.

The Welsbach Incandescent Gas Light Co., Ltd. (Electric Light Section), 344 to 354, Gray's Inn Road, London, W.C.—A fine electric fittings catalogue of just upon 140 pages, for the 1910-11 season, has just been issued. It contains a very varied collection, including many excellent specimens of designs of fittings, glass and silk shades, and electrical accessories, prices of all being plainly indicated, and numerical and sectional indexes given. The first 14 pages are devoted to illustrations of a number of one and two-light brackets of all classes of designs and finishes; table, floor and newel standards come next, and electroliers and chain pendants then have between 40 and 50 pages to themselves. Many examples appear of dining-room counterweight pendants, dressing-table two-light counterweight pendants, ceiling fittings, flexible cord and chain pendants, lantern and fancy globe pendants, switch plates, radiators, cast-iron and brass watertight fittings. The accessories include silk and glass shades, lampholders, switches, adapters, &c. A loose accompanying list gives prices of Welsbach metallic-filament lamps of from 10 to 200 c.p.

Messrs. Arthur Jopling & Co., 10, Westmorland Buildings, Aldersgate Street, E.C.—A September, 1910, price list of "Ajaco" metal-filament lamps has been issued, showing prices of lamps of 25-50, 60-80, 81-130 and 200-260 volts, with pear-shape and round bulbs respectively. The filaments are claimed to be strong, and the life is 1,000 hours.

Allgemeine Elektricitats-Gesellschaft, Berlin.—Recent publications of the A.E.G. deal with the various types of supply meters made by the company, and their applications; their enclosed switchboxes and other installation material for use in exposed situations; and their automatic pressure regulators on the Tirrill system, which is very fully described and illustrated. The system has been greatly elaborated and extended to cover a large range of conditions, and the admirable results obtained are shown by voltage records. A small pamphlet describes, with numerous illustrations, the charging of the battery of an electromobile by a charming young woman, from a.c. mains, with the aid of the mercury-vapour rectifier and switchgear of the G.E. Co. (Schenectady).

New Works at Barry.—It is reported (says the *Daily News*) that two large schemes for the establishment of industrial works at Barry are about to be launched. One scheme involves capital to the amount of a million pounds, and the object is the establishment of coal washeries, coke-ovens, blast furnaces, an electric power station, steelworks and tinplate and galvanising works.

A meeting of city financiers, and others interested in the development of Barry as an industrial centre, was held on September 28th in London, as a result of which it is believed that estimates will shortly be prepared for the erection on Sully Point of steel-works and rail mills.

Trade Announcements.—Messrs. W. V. Waite & Co. have opened offices at 31, Queen Street, Cardiff, for the purpose of trading as engineers, also buying and selling agents. Manufacturers are invited to send lists and catalogues.

Messrs. Offord & Co., electrical engineers and manufacturers, have removed their offices and works to more commodious premises at 76, Belmont Row, Birmingham.

The Stirling Boiler Co., Ltd., have removed their offices from 25 to 58, Victoria Street, Westminster, S.W.

Messrs. Heathman & Co. having removed to their new freehold factory at Parson's Green, Fulham, are now seeking a tenant for their late factory at 37, Endell Street, Long Acre, W.C.

The businesses of the Foster Arc Lamp and Engineering Co., Ltd., and the Brockie-Pell Arc Lamp Co., both of Wimbledon, have been amalgamated under the title of the Foster Engineering Co., Ltd., electrical and general engineers. All communications for either company should now be addressed to the F.E. Co., Ltd., at Morden Road, Wimbledon, which company takes over all liabilities, &c., of both concerns from October 1st. Both companies' offices, stores, works, &c., have been moved to new and extensive works in Morden Road, Wimbledon, which stand on 3½ acres, and are close to the railway.

Messrs. T. & E. Wannbacher have removed to 5, Appold Street, London, E.C. Their telephone number and telegraphic address remain unaltered.

The Adnil Electric Co., Ltd., advise us that they have appointed Messrs. Scattergood & Johnson, of Leeds, their representatives for the sale of their Bergmann dynamos and motors in the Yorkshire district, Mr. J. B. Chambers, who has represented the Adnil Electric Co., Ltd., in Yorkshire, having resigned to take up an appointment in Eastern Europe.

Messrs. McClure & Whitfield, of the Mersey Dynamo Works, Stockport, announce that their London representatives for d.c. machinery of all sizes are Messrs. Hogan & Wardrop, 2, Gresham Buildings, Basinghall Street, E.C.

Owing to increased business in carbons, cables, insulators, metal filament lamps and electrical accessories generally, the Sloan Electrical Co., Ltd., will shortly be removing to more commodious premises at Conradty House, 12, Golden Lane, E.C.

Hampstead Electrical Exhibition.—An interesting Exhibition of Domestic Electrical Appliances was opened at Hampstead on Tuesday afternoon by the Mayor, and it is now in progress. To-morrow (Saturday) night it will close. A goodly number of exhibitors have succeeded, under the auspices of the Corporation Electricity Department, and with Mr. G. H. Cottam's guidance, in making a very attractive display, which should educate and edify the large crowds who find their way to the Hampstead Baths in Finchley Road. The following is a list of the firms who are in evidence and of some of the appliances that they are showing:—

Eric Rivers-Smith, Ediswan & Bastian cooking and heating apparatus.
Purcell & Nobbs, fresh air electric heaters, Electroyl heaters, Electroyl heating appliances, &c.
Premier Electrical Co., heating and cooking apparatus, glass shades, fittings and "Premelco" metal-filament lamps.
Ozonair, Ltd., Ozonair apparatus and ventilating system.
E. F. Moy, Ltd., screwing lathe driven by electric motor (Fuller).
Eastman & Warne, electric flat-irons, convectors, &c.
Duncan Watson & Co., "Santo" vacuum cleaners.
Holmquist Electric Co., Ltd., folding electric bath cabinet, "Universal" hot air and light apparatus, electric ovens, flat-irons, radiators, bed-warmers, &c.
E. G. Kellond, heating and cooking apparatus and wooden electric light fittings.
Rashleigh Phipps & Co., heating and cooking apparatus.
Roper & Co., "Archer" system of electric heating and cooking, lamp shades and novelties.
F. Troy & Co., electric heating and cooking apparatus.
Hampstead Corporation Electricity Department, inquiry bureau.
Harper Electric Piano Co., Ltd., electric pianos.
Berry Construction Co., Ltd., "Tricity" cookers and cooking ranges.
Spagnoletti, Ltd., "Therol" heaters and accelerators.
Aron Clock Co., electrically-wound clocks.
Adam Watkin & Co., Ltd., Watkin switch.
Siemens Bros. & Co., Ltd., and Siemens Bros. Dynamo Works Co., Ltd. — The O.S. wiring system, tantalum lamps, "Onewatt" lamps, fittings, heating and cooking apparatus, and "Zed" fuses.
Messrs. W. Leonard & R. C. Jeboult, automatic electric signs and specialities.
Hampstead Corporation Electricity Department, exhibition of joint-boxes, showing methods of connecting houses, &c., to the supply mains.
Fuller Electrical Co., a.c. motors and lamps.
Fred. Hodgson, electric lifts, heating and cooking apparatus.
Drake & Gorham, Ltd., Bastian heating apparatus.
William Smith, electrical fittings and apparatus.

Electrical Exhibition.—On Thursday last, Mr. Harry Moss, engineer to the Grassington Electric Supply Co., Ltd, promoted an exhibition of electric lighting, heating and other appliances, and in the evening lectured and demonstrated on the benefits of electricity in the household.

Book Notices.—*Livingstone's Diagram for the Easy Calculation of Shaft or Beam Deflections.* London: *Electrician* Publishing Co. 2s. 6d. net.—This is an ingenious device for determining the deflection of a beam or shaft under any system of loads. It is possible, by a little exercise in simple addition, to find the deflection at any point in the beam. The theory depends on the fact that the deflection of a beam is given by an expression of the form $K\ WL^3/EI$, where W is the weight of the load, L is the span, E Young's Modulus, and I the moment of inertia of the cross-section of the beam, K being a constant which the chart enables us to determine. The chart consists of a number of curves relating to positions on the beam at which deflections may be required, these positions being measured by the ratio of the distance from one bearing to the whole span. The curves are plotted on scale paper which is graduated along one axis to show positions of concentrated loads along the span. The other axis is graduated in values of K. Suppose a load of 4,000 lb. is situated at a distance of 20 ft. from one bearing of a beam of 100 ft. span, and the consequent deflection is required at a point 40 ft. from the bearing. The load is at ·2 of the span, the deflection is required at ·4 span. On the chart, project from the mark ·2 on the line of load positions, on to the curve of deflection position marked ·4. Project at right angles from this point on to the line of K, which is seen to be 0·0121. Thus the deflection is $\frac{4{,}000 \times 100^3 \times 12^3 \times 0{\cdot}0121}{EI}$, where I is in inch^4 units. A further parabolic curve is given which similarly enables the deflection to be measured at any point due to the uniformly distributed load due to the weight of the beam or shaft. For a given system of loading, the values of K are found for each separate load and for the weight of the beam. Each K is multiplied by its corresponding weight, and the whole are added up. The total is then multiplied by L^3/EI where L is in inches. The diagram cannot fail to be a time-saver if many such calculations have to be made.

Railway Rates (Whettall's Permanent Rate Book). By S. Whettall (author and publisher), Tingley, near Wakefield. Price 5s. net.—The author, who is a specialist on questions connected with railway charges, has written this work for all who have dealings with the railway companies, with a view to enabling them to check their accounts thoroughly and to avail themselves of the lowest rates. For this purpose, the system of classification of goods in vogue is briefly explained, and numerous hints are given showing how and when the cheaper of alternative rates can be claimed, overcharges disputed or avoided, special rates ascertained, rebates secured and so on. The rest of the volume, which is mounted in a spring binder, consists of a number of pages ruled for entering the description of goods dealt in and the corresponding rates, and other pages ruled for the entry of specific consignments, with the destination, class rates, and special rates—this section constituting the bulk of the volume. Thanks to the system of binding, the number of pages can be greatly increased, or used pages removed for filing, with ease. In view of the heavy cost of railway transport, especially in small consignments, and the great liability to incur unnecessary

expense due to oversight or lack of familiarity with so complicated a matter, this work ought to prove both useful and profitable to shippers.

"A Text-Book of Physics." By H. E. Hurst and R. T. Lattery. 1910. London: Constable & Co., Ltd. Price 8s. 6d. net.

"Science Abstracts." Vol. XIII, Part 9. September 26th, 1910. Sections A and B. London: E. & F. N. Spon, Ltd. Price 1s. 6d. each.

"*Transactions* of the Illuminating Engineering Society." Vol. V, No. 4. April, 1910. Easton, Pa.: The Society. Price 75 cents.

"The Physical Review." Vol. XXXI, No. 3. September, 1910. Lancaster, Pa.: The *Review* Offices.

"*Journal* of the Western Society of Engineers." Vol. XV, No. 4. August, 1910. Chicago: The Society. Price 50 cents.

"Il Nuovo Cimento." August, 1910. Rome: Istituto Fisico.

"*Transactions* of the Institution of Civil Engineers of Ireland." Vol. XXXVI. November, 1909, to May, 1910. Dublin: John Falconer.

"The Students' Catechism on Book-keeping, Accounting and Banking." By F. Davey. 1910. London: Butterworth & Co. Price 3s. 6d.

"Prospectus of the Royal College of Art, London." 1910-11. London: Wyman & Sons, Ltd. Price 3d.

"Electric Circuit Problems in Mines and Factories." By Ellis H. Crapper. London: *Colliery Guardian* Co., Ltd. Price 3s. 6d. net.

Proceedings of the Incorporated Municipal Electrical Association, 1910. London: Wyman & Sons. Price 5s.—This issue contains the proceedings at the Annual Convention held in June last, with the report and balance-sheet, &c.

Dissolutions and Liquidations.—Cascade (1906) Power Co., Ltd.—This company is winding up voluntarily, with Mr. A. G. Bartholomew, 695, Salisbury House, London Wall, E.C., as liquidator. Creditors should forward particulars by November 1st.

Hal Williams & Bridges.—Messrs. H. Williams & W. Bridges, consulting engineers, 3, Salter's Hall Court, E.C., have dissolved partnership.

Stead & Illingworth, dealers in electric fittings and appliances, Haugh Shaw Works, Halifax.—Messrs. H. Stead & W. H. Illingworth, have dissolved partnership. Mr. Stead attends to debts, &c.

Woodhead Partners, electrical engineers and contractors, Gascoigne Street, Leeds.—Messrs. J. H. Woodhead and Harry Woodhead have dissolved partnership.

Bankruptcy Proceedings.—W. H. Hunter, plumber and electrician, Towyn, Merionethshire.—Receiving order made September 30th on creditor's petition.

Harold Bristow, plumber and electrician, Kingston-upon-Hull.—A first and final dividend of 4¼d. in the £ is payable October 10th at York City Chambers, Lowgate, Hull.

Frederick Peacock, 59, North Station Road, Colchester, Essex, electrician. — The following are creditors: — Williams & Co., Chester, £148; Greene, King & Son, Colchester, £14.

Alan McAlpin (McAlpin & Co.), electrical engineer, Leicester.—A first and final dividend of 1s. in the £ is payable October 5th, at 24, Friar Lane, Leicester.

Manchester Engineering Exhibition.—At the Engineering and Machinery Exhibition, which opens at Manchester on October 14th, Messrs. C. E. Lugard & Co., of Chester, are showing a planing machine fitted with their patent S.M. electromagnetic drive.

For Sale.—Particulars appear among our advertisement pages of certain De Laval turbine dynamos, Allen engine and dynamos, Körting and other ejector condensers, that are offered for sale by the Sterling Telephone and Electric Co., Ltd.

LIGHTING and POWER NOTES.

Aberdeen. — The Corporation electrical engineer's suggestion that a bonus system should be established to encourage employés, was recently considered by the Electricity Committee. A majority of the members were of opinion that such an arrangement would not, under the circumstances of Corporation employment, be desirable.

Accrington.—At the request of the B. of T., the Corporations of Accrington and Haslingden sent representatives to London on September 28th, with reference to Accrington's application to supply Haslingden with electricity in bulk. Accrington and Haslingden entered into a provisional agreement, but the South Lancashire Electric Co. deposited an objection to the agreement being made effective. No decision was given on the question. Accrington has applied to the L.G.B. for powers to borrow the money required for the scheme. Haslingden will now make a similar application, and the L.G.B. and the B. of T. are expected to confer on the question.

At a meeting of the Electricity Committee, the town clerk was authorised to take the necessary steps to obtain a prov. order under the Electric Lighting Acts on behalf of Clayton-le-Moors Council, and at the completion of the agreement, for its transfer to the Corporation.

The Electricity Committee has agreed to supply electricity in bulk to Oswaldtwistle D.C. on terms similar to those contained in the agreement with the Haslingden Corporation. The yearly minimum payment is at the following rates:—£200 for the first year, £250 second, £300 third, £350 fourth, £400 fifth, £450 sixth, £500 seventh. As an alternative, the Corporation offers to promote and transfer a prov. order for supplying Oswaldtwistle in detail, on the same scale as that in force at Accrington.

Aston Manor.—The T.C. has received from the L.G.B. sanction to loans of £12,515 for plant at the generating and sub-station, £450 for a site for a sub-station, £2,250 for the erection and equipment of a sub-station, and £6,000 for mains.

Australia. — The *Australian Mining Standard and Electrical Record* states that the Balmain (N.S.W.) Electric Light and Power Corporation, Ltd., is pushing on arrangements for supplying electricity to New Town Municipal Council. Erskineville Council has, as a result, been led to inquire into the subject of electric lighting.—The report of Mr. A. H. Wood, electrical engineer, regarding the Yea and Mansfield (V.) Dairy Board's electric lighting and pumping scheme, states that the cost would be £3,500. He recommends a 115-B.H.P. suction gas engine plant, providing for public and private lighting, pumping and power for the butter factory. A conference of the interested bodies is to be held.—A preliminary survey of a storage in the river channels above the Oallen crossing has been made in connection with the proposed utilisation of the waters of the Shoalhaven (N.S.W.) in Goulburn district, for generating electricity.—When the Camberwell (V.) ratepayers were asked recently to vote regarding the proposal of the Melbourne Electric Supply Co. to apply for an electric lighting Order-in-Council, 1,134 voted for electric lighting and only 24 against!—Euroa (V.), which has a population of 5,590, (Euroa-town, 1,700), has ordered a report on electric lighting, and is inviting machinery firms to submit specifications and prices of a suitable plant.—At Eaglehawk (V.), 620 votes have been cast in favour of a municipal electric lighting installation, and 542 for a continuance of gas lighting.—Mr. W. Reid Bell, M.Inst.C.E., and Mr. W. P. Hales, M.Inst.C.E., have reported to the Launceston Council on a £3,000 scheme for obtaining more power from the South Esk river for the purpose of running the city electrical plant. They propose augmenting the river flow in dry weather (80 days) from Arthur's and Wood's Lakes.—The scheme for the erection of an important power station on the Derwent River, near Hobart (T.) has taken definite shape. A company, by erecting a concrete weir to raise the level of the river by upwards of 10 ft., would enable about 2,000 H.P. to be obtained from a 10-ft. head, or 5,000 H.P. from a 20-ft. head. The manufacture of calcium carbide is the primary object of the enterprise.

Barnstaple.—The T.C. has agreed to supply electricity to the Barnstaple Cabinet Co. and other large power consumers at 2d. per unit for the first 4,000 units per quarter; 1½d. per unit for the next 3,000; and 1¼d. per unit for the next 3,000.

The T.C., in the interests of the undertaking, has decided to appoint a firm (or firms not exceeding two) to "energetically undertake" the exhibition and supply of electric light fittings, such firm, or firms, to have the exclusive right of supplying incandescent lamps to the Council at an agreed rate, and to receive a rebate for current supplied to them on consideration of an effective display of electric light fittings being made. The firm, or firms, appointed are to be permitted to style themselves "official electrical repairers and contractors to the Barnstaple Corporation."

Bispham.—The U.D.C. has applied to the B. of T. for sanction under Sec. 2 of the E.L. Act, 1909, for the construction of a generating station in Red Bank Road, for the purposes of the E.L. Order.

Cape Colony.—Arrangements are being made by the Cape Town Council to supply 14 additional 100-C.P. lamps within the Sea Point municipality, the cost being £6 each per annum.

Chelmsford.—The T.C. on September 28th decided to accept the tender of the Electric Supply Corporation for lighting the North and South Wards with arc lamps of 2,750 C.P., and 110-C.P. incandescent lamps (with 200 C.P. at street corners), the total annual cost being £1,396 10s.

Continental Notes.—France.—La Compagnie Parisienne de Distribution de l'Electricité, of Paris, is about to commence the construction of two new large electricity generating stations—one in the north of the capital at St. Ouen and the other in the southern district, at Issy-les-Moulineaux. Ten sets of steam turbines and generators—three for the southern station and seven for the northern one—have already been ordered. Each of the turbines will be connected up to a two-phase alternator giving 10,000 KW. at 12,300 volts and to two continuous-current dynamos. One of the latter is intended for the excitation of the alternator and the other to drive the two motors which operate the turbine condenser.

Austria-Hungary.—A central electric lighting station has recently been completed and put in operation in the little town of Nasice, Slavonia.

Germany.—During the past 12 months a 2,500-H.P. gas engine and dynamo has been added to the plant at the La Paix blast furnaces of the Société des Hauts-Fourneaux Lorrains Aumetz-La Piz, Lorraine, and work is now in hand on the installation of a further set of 1,500 H.P.

Spain.—The Sociedad Electro Hidraulica del Turia has been authorised to make use of water from the River Turia in the dis-

trict of Gestalgar, to the extent of 15,000 litres per second for the generation of electric energy, and the Sociedad Barcelonesa Industria y Minas to utilise the waters of the River Las Coireiras, in the district of Moino Vello, to the extent of 1,000 litres per second, for a similar purpose.

Epsom.—Another letter has been written to the U.D.C. by Mr. Foster, late consulting engineer to the Epsom electricity undertaking, in which he challenges the chairman of the Lighting Committee to say in plain language what he means when he speaks of his (Mr. Foster's) insinuations. He alleges that he has never received justice at the hands of the Council, and that the proceedings of the Investigation Committee were a scandal. In reply to the letter, the chairman has expressed his intention to substantiate his statements at a public meeting.

Fife.—The contractors for the Rosyth Naval Base, Messrs. Easton, Gibb & Son, have now practically ready at their power station the fourth engine, making a total of 700 KW. of plant. An order has been placed for a fifth unit, and this will be available in about 10 weeks. This, it is expected, will meet the demand for some little time. These engines and producer plants were supplied by the National Gas Engine Co., and are of their latest twin-cylinder type, running at 175 R.P.M., belt-connected to generators by J. P. Hall & Co., Oldham, which run at 600 R.P.M. The average demand for power is about 30,000 units per week. The monolith sinking—the most important part of the undertaking—is entirely dependent upon the power station, as all the machinery is electrically driven. At the moment there are employed upon this work 16 7-ton travelling cranes, each driven by a 55-H.P. motor, several concrete mixers, boring machines and large capacity sinking and other pumps, with the necessary arc and incandescent lamps for night working. The Freestone Quarry, a mile from the power station, requires 100 H.P. for driving air-compressors, cranes, blowers, &c. A large stone-crushing battery and gauging station for the concrete requires 300 H.P., and is electrically driven. There are at the moment some 80 motors of from 3 to 80 B.H.P., and these, with some 80 arc lamps and about 2,000 incandescent lamps, give a steady demand upon the power station, which, of course, runs night and day.

Fleetwood.—The L.G.B. has sanctioned the borrowing of £2,980 repayable in 18 years, and £1,120 repayable in 30 years, in connection with the electricity undertaking.

Fochabers.—Owing to the extended use of electricity and the difficulty of keeping the present hydro-electric plant at work, particularly during heavy frosts, the Duke of Richmond and Gordon has commissioned Messrs. Drake & Gorham (who carried out the original work) to construct a supplementary steam plant consiting of a 120-H.P. Willans engine and generator with a loco-type boiler. Is is expected that the work will soon be completed.

Frodingham.—The ratepayers have decided to adopt electricity for public lighting.

Halifax.—The Chamber of Trade has sent to the T.C. a protest against the Corporation giving its moral support to the Bill of the I.M.E.A. for legalising the trading in electric light fittings, &c., by corporations, on the ground that this is interfering with the livelihood of a section of the ratepayers.

Hanwell.—At the last meeting of the District Council a letter was read from the secretary of the Metropolitan Electric Supply Co., Ltd., in reference to the company's contract for lighting in the Uxbridge Road. The contract is for the fixing of 12 flame arc lamps, combined with small incandescent lamps, which are to be switched on in place of the arcs from midnight until dawn, but the company now suggest that a new type of high candle-power metallic-filament lamp should be used, which would give an improved light. The proposal is to place 30 of these high candle-power lamps on either side of the main road, spaced on alternate tramway pillars, half the lamps to be extinguished at midnight. The company states that the cost would be slightly greater, but it is prepared to adopt this system because it considers its effect would be far superior to the original scheme, and for the purpose of showing the effect of these new lamps it is arranging to fix a few experimental ones so that the Council may have an opportunity of inspecting them. The Public Lighting Committee is to inspect the lamps when fixed.

Haslingden.—The borough surveyor, lighting inspector, and tramways manager have been deputed to go into the question of lighting the street lamps within the compulsory area by electricity, and to prepare schemes and estimates of the probable cost.

Havant.—The U.D.C. has decided to wait for another year before applying for a prov. order for electric supply, "in view of the Council's present financial position."

Heston and Isleworth.—£3,048 is to be borrowed for an extension of the electric lighting works, and application is to be made to the L.G.B. for sanction to borrow £1,200 and £800 for mains and house services respectively. As an alternative to the existing rates, consumers using power continuously for not more than 12 hours daily are to be supplied at a fixed annual charge of £10 per KW., such charge to be paid in equal quarterly instalments, and to be based on the maximum number of KW. demanded at any one time. The Council has fixed the price to be charged for current for cooking apparatus at 1½d. per unit.

Hornsey.—Application is to be made to the L.G.B. to sanction the borrowing of £2,000 for mains, and £4,000 for house services. The borough surveyor is to report on the subject of the lighting of the business parts of the borough. The matter was brought up on a resolution of the local Tradesmen's Association, calling attention to the desirability of lighting those portions of the town with arc lamps of a more efficient and economical type than are in use at present.

Kingsbury.—Mr. Jose Diaz, chairman, reported at the last meeting of the Council, that private consumers could be supplied with energy within a short time. He trusted that they would generally make application, as electricity was cheaper in the long run than gas, with the troublesome and perishable incandescent mantles.

Kingston.—At a recent meeting of the Council it was stated that the loss on the electricity department for the last six months had been £500, and Councillor Scott said that an estimated loss of £1,100 on the year had now increased to £1,600. The large deficit is attributed to the reduction in the consumption of energy caused by the introduction of metallic-filament lamps and also to the laying of new mains out of revenue instead of capital. The charge per unit is 5d., and it was urged that consumers should be charged more. A further statement was made at the meeting that nine-tenths of the ratepayers (in value) used electric light, and that the general public had the benefit of the light in the streets.

Knaresborough.—The R.D.C. has consented to Harrogate T.C. supplying current for private lighting to residences outside the borough and within the rural area.

Littleborough (Lancs.).—The U.D.C. has received sanction from the L.G.B. to borrow £3,221 for electric lighting purposes; the Council asked for £3,500.

London.—Marylebone.—The general manager of the electricity undertaking reports that the gross income for the June quarter shows an advance of £160 over the corresponding three months of 1909, but eliminating the adjustment item (which applies to accounts prior to June) the real increase is £419. The increase in units sold to private consumers amounts to 113,447, or 6·2 per cent. for the quarter, compared with 8 per cent. estimated for the whole year. The total increase in units sold, including public lighting, is 260,577, or 14 per cent. The drop in average price obtained appears to have been largely arrested. The average price during the quarter, including meter rents, was 3·103d. per unit, and in June, 1909, 3·240d. per unit. The diminution in price is thus 4·2 per cent. In the previous June the decrease was 11·5 per cent., and the estimate for this year was 9 per cent. The generation expenses were £4,173, as against £4,888 in June, 1909, and £4,930 in June, 1908. The total expenditure during the three periods was £10,578, £10,048, and £11,785. There was an increase in each of the headings, except generation. A law suit accounted for £300, and with regard to management and distribution expenses (£2,017 and £2,220, as against £1,717, and £2,081 in June, 1909), the increase was in the main due to the larger establishment necessary to cope with the increased activities of the department, and the additional consumers on the books. They had added double the number of new consumers during the past 12 months, compared with the preceding year, viz., 600 against 300, and although the value of revenue per consumer was smaller, the establishment charges were nearly as heavy. After expressing the belief that certain reductions could now be effected, Mr. Seabrook went on to say that the costs of production, &c., was 1·20d. per unit, as against 1·29d. in 1909, and 1·54d. in 1908. With regard to the sales department, the income included £2,360 sundry sales, which, less prime cost, £1,805, left a balance of £555. The rental of motors on hire amounted to £100, the maintenance of consumers' installations £101, and the payments under the hire-purchase agreements came to £98, making a total of receipts of £856. The expenditure was £1,365, leaving a net debit balance of £509. Various orders in hand were incomplete, but, taking credit for these on a conservative basis, the net debit on the sales department was £368. After taking all things into consideration, the probable actual cost of this department for the quarter did not exceed £273, which was the ascertained cost of the old publicity department during June quarter, 1909. The net result of the quarter's trading was a credit balance of £15,485, compared with £15,188 in the previous June quarter.

Stepney.—Application is to be made to the L.C.C. for sanction to borrow £7,150 to cover the cost of plant at the Limehouse generating station. From March 31st to September 17th the number of units generated and purchased in bulk were 3,742,129, as against 3,375,490 in the corresponding period of last year. The Works Committee has again considered the proposals of the L.C.C. for the electrification of the tramways in Burdett Road and Grove Road. The B.C. Committee does not see its way to depart from the decision already arrived at—*i.e.*, not to consent to the use of overhead traction.

Newcastle-on-Tyne.—The new station of the Newcastle-on-Tyne Electric Supply Co. at Dunston-on-Tyne is making good progress, and when it is opened it will make the twelfth power station feeding into the network of mains which now covers the North-East Coast industrial district. Ultimately, it will probably be the largest in the district, but for the present Carville is the largest with some 50,000 H.P. Among the other stations from which power is supplied are those at Neptune Bank, 6,800 H.P.; Philadelphia, 12,000 H.P.; Hebburn, 4,200 H.P.; and Grangetown, near Middlesbrough, 8,000 H.P., the latter belonging to the Cleveland and Durham Electric Power Co. In the five other stations power is produced from waste heat.

A new electrical sub-station has recently been put into commission by the Newcastle-upon-Tyne Co. for supplying the growing demand for power at the works of Messrs. Parsons, Henry Watson and Sons, and Messrs. Donkin, at Heaton, Newcastle-on-Tyne. The building will accommodate some 1,500 H.P. of transforming plant, there being at present in it two 700-H.P. transformers. The switchgear for the high-pressure 5,500-volt side is of the Brown, Boveri type, there being two combined feeder and transformer panels. The switchgear for controlling the low-pressure current at 440 volts, which is used in the works, is by Messrs. Reyrolle.

The capacity of the sub-station of the Newcastle-on-Tyne Co., which feeds the Wallsend shipyard of Messrs. Swan, Hunter and Wigham Richardson, has recently been increased, and is now capable of giving a maximum output of 3,000 H.P.; the plant consists of four oil-cooled, three-phase transformers, and the necessary switchgear.

Oldham.—At the meeting this week of the Electricity Committee, Mr. Newington, the engineer, presented a report and recommendation for an addition to the generating plant at the Greenhill electricity station. He stated that the total plant capacity of the station at full load was 3,900 KW. Last winter the maximum demand was 3,318 KW. The prospective demand was such that the plant would be fully loaded. There was room for three 1,200-KW. sets in the present bay of the engine room, and the proposition was to put in a low-pressure generating set. They were progressing at the rate of 200 KW. per annum. It was decided to fully consider the report prior to taking action.

Ottery St. Mary.—A public meeting was held on Friday last for the purpose of considering a scheme to light the town with electricity. Lord Coleridge presided over a large attendance, and called upon Mr. Steeve, a representative of Messrs. J. and W. Purves, of Exeter, to give an outline of the proposed scheme. Mr. Steeve said a very important feature connected with Ottery was that there was an abundant water supply available for driving power. Consequently, electricity could be generated as cheaply as it was possible to get it. In the proposed scheme the mains would be carried overhead in order to cut down cost. The mains would be available up to the end of every street in the town, and in some instances some distance out of the town so that almost all people living within a reasonable distance of Ottery could be supplied. It was proposed to make a charge of about 6d. per unit. The capital required for a good scheme to be started was about £2,000. The expenditure for the first year's working would amount to something like £157 10s. The company were willing to assist financially up to about £500. An absolute estimate of the cost for getting the light into houses, shops, &c., could not be given, but it would roughly be, on an average, about 7s. 6d. to 10s. per lamp. It was decided to further consider the question.

Pakefield (near Lowestoft).—At the request of the P.C., the R.D.C. has decided to oppose the application of a private company for a prov. order for electric supply in the parish.

Perth.—A scheme for the introduction, at a cost of £400, of electric stoking machinery at the gas works, has been rejected by the T.C. The introduction of such machinery would, it was urged, result in a reduction in the price of gas.

Portsmouth.—In response to complaints from tradesmen, the E.L. Committee has decided to prohibit employés at the electricity works from accepting private work, except with sanction first given by the Committee.

St. Helens.—The T.C. has received from the L.G.B. sanction to loans of £5,073 for switchgear and a turbo-alternator, £4,567 for transformers, rotary converters, water softening plant, and £566 for extension of buildings at the electricity works.

Salford.—An agreement has been entered into with the Manchester Corporation for a temporary supply of energy from the Sherbourne Street sub-station during the ensuing winter months, on the terms and conditions contained in the agreement between the two Corporations dated September 19th, 1908, which agreement expired on June 30th last. The only alteration is that the new agreement is to be determinable on receipt of three months' notice from either side.

Southgate.—The North Metropolitan Electric Power Supply Co. has intimated that it intends to lay a trunk main from Enfield to Wood Green passing through Southgate.

Staveley.—An effort is being made to secure a supply of electricity for Staveley, near Chesterfield, from the mains of the Devonshire Works, which are being taken through the parish to the firm's collieries.

Stoke-on-Trent.—At the meeting of the T.C., on Thursday last week, Councillor Willett made a statement with regard to troubles experienced with alternators Nos. 1 and 2 at the Hanley works. Recently, he said, the Westinghouse Co. had repudiated any liability for the breakdown of No. 2, and had refused to return the alternator properly repaired until they received a cheque for £133, being the cost price of repair. The Committee had paid the sum "without prejudice to any right of action." The alternator was returned on September 24th, but it had broken down again that morning. If the other alternator—another machine of the same character—happened to fail before No. 2 was repaired, Hanley would be in the dark. The Mayor advised the Council not to go into details, as the matter was *sub judice*.

Torquay.—An elaborate scheme for the illumination of Prince's Pier and Gardens by electricity is being devised by the borough electrical engineer.

Walsall.—Mr. H. R. Hooper, of the L.G.B., held an inquiry on Thursday last week with respect to an application by the T.C. for sanction to borrow £23,225 for the purposes of the Corporation's electricity works. It may be remembered that originally the Council applied for sanction to a loan of £35,000; but, after a protracted inquiry, the L.G.B. withheld its consent, and at the same time asked the Corporation to consider a suggestion made by the Inspector. At the opening of the inquiry on Thursday, the Inspector intimated that, having on a previous occasion discussed the Corporation's existing system of generation and distribution of current, he was in a position to state that the Department fully appreciated the difficulty the Corporation were in with regard to affording a cheap supply of current for manufacturing purposes, particularly in view of the proximity of the town to Birmingham and Wolverhampton. The town clerk said there were three points to which the Inspector's report called attention. The first was that instead of building a new generating station, the existing building should be enlarged; the second was that further consideration should be given to the question of obtaining a supply in bulk from the Shropshire Co.; and the third, the wisdom of extending the scheme to the outlying portion of the town known as Bloxwich. These points, the town clerk said, had been carefully gone into by the Electricity Committee of the Council, and with regard to the first it was found that certain of the existing plant would have to be superseded, the engine-room altered, and new machinery obtained. With regard to the second point, supply in bulk, the Committee impartially discussed the matter. The Shropshire Co. had power to supply in bulk in the borough of Walsall with the consent, and only with the consent, of the Corporation. The Corporation has received from that company two offers. One was with respect to the supply of sufficient current to provide for the needs of the Corporation, and which would mean the scrapping of the existing plant. The other offer was for a similar quantity to supplement the supply from the generating plant at the Corporation station. That would mean a supply of 2,500,000 units per annum, and the company quoted ·75d. per unit. The Council's engineer was satisfied, providing the L.G.B. sanctioned the scheme, that he could supply it at ·71d., which was the actual result upon last year's working. It was probable that he would be able to generate at a cost of ·52d. With respect to the Bloxwich, the town clerk said there were already existing there many works, the proprietors of which would be glad to have the opportunity of taking a supply of electricity. In reply to the Inspector, Mr. A. S. Barnard, the Corporation's electrical engineer, said he was not prepared to say that the loan asked for would meet the requirements of the undertaking for the next five years. He added that up to the present, however, the Corporation had not been able to offer terms which would induce manufacturers to use electricity for power purposes.

West Bromwich.—The borough electrical engineer, Mr. Jackson, in a report just issued, comments upon remarks made by Mr. H. R. Hooper, L.G.B. Inspector, at a recent inquiry respecting an application by the Corporation to borrow £11,386 for the purpose of installing a 1,000-KW. D.C. turbo-generator. The Inspector's remarks, he points out, implied that direct-current extensions of this magnitude were uncommon. Mr. Jackson now says he has carefully considered the question of the alternating-current system suggested by the Inspector, and was more than justified in his support of the direct-current system at the inquiry, and he estimates that the costs to meet interest, sinking fund, and running charges would be increased by nearly 50 per cent. per annum by the installation of an alternating-current turbo-generator. The direct-current supply had effectually met the demand for power purposes in the borough up to the present, and he saw no reason to spend an additional £2,000 in putting down an alternating current system.

Wharfedale.—Another scheme is on foot to supply electrical energy in Wharfedale, especially the districts of Otley, Burley and Menston, and will be laid before the Otley U.D.C., who will be asked to give their approval to the application by a company about to be formed, for a provisional order to supply electricity in the district. The intention is to erect a generating station at Otley, with radiating mains throughout the town and also to Burley and Menston, each 2½ miles away. More than 10 years ago an idea was advanced in the Council of promoting a similar scheme, and Mr. Geo. Wilkinson, in an exhaustive report, showed that, if power was obtained by water and by a refuse destructor, a profit of £1,240 per annum could be made if electricity were retailed at 6d. per unit.

Whitchurch.—The Electrical Committee of the Cardiff T.C. has decided to approach the Llandaff and Dinas Powis R.D.C. with a view to obtaining sanction to the E.L. mains being extended to Whitchurch, which is outside the city, and where between 500 and 600 houses are being built.

Wigan.—The electrical engineer and the waterworks manager have been instructed to prepare plans and specifications for the installation of two electrically-driven centrifugal pumps at the pumping station, Boar's Head. The electrical engineer reported to the Waterworks Committee, that the cost of two Rees Roturbo centrifugal pumps, including motors and starters, would be £282, and two three-throw Worthington pumps, including motors and starters, would cost £1,224. He had no hesitation in recommending

centrifugal pumps. With regard to annual cost, he was prepared to recommend his Committee to supply the energy necessary at an annual cost of £500.

York.—The Electricity Committee of the T.C. has directed that drawings, estimates and specifications shall be prepared for extensions to the plant at the electricity works, in order to provide stand-by plant.

Ystalyfera.—An electric lighting scheme has been submitted to the local authority by Mr. Evan Lewis, of Craig-y-pal, near Glais, who offers to supply electricity to private houses at a rate which will be cheaper than the present cost of gas.

TRAMWAY and RAILWAY NOTES.

Accrington.—Accrington T.C. has intimated its intention to appeal against the increase in the assessment of the tramways from £595 to £1,650. It proposes asking the Corporations of Haslingden and Rawtenstall and the District Council of Clayton-le-Moors to assist in resisting the increased assessment.

Belfast.—The Corporation has approved of an arbitrator being appointed in connection with the proposed purchase of the Cavehill and Whitewell tramway system, a matter which has been hanging on for the past three years or so.

Birkenhead.—With regard to the suggested linking-up of Birkenhead and Wallasey by tramway, *via* the Poulton penny bridge, the town clerk of Birkenhead has written the Wallasey Council that it may be some time before he will be able to communicate with the Council regarding a meeting between representatives of the two authorities.

Burnley.—Major Pringle, B. of T. Inspector, visited Burnley on September 29th, to inspect the new branch tramway line in Briercliffe Road. Along with the tramway manager and other officials, he travelled the full length, which was afterwards opened for traffic. The extension ranges over 1,242 yards.

The tramway department has had delivered a 35-40-H.P. motor tower wagon for the purpose of getting to breakdowns quickly.

Continental Notes.—GERMANY.—The construction of an electric tramway between Beuthen, Baingow and Laurahutte, Upper Silesia, has been decided upon.

A scheme for the construction of a light electric railway between Morheim and Baumberg is at present under consideration.

ITALY.—The Società Anonima delle Tramvie e Ferrovie Elettriche di Roma has secured a concession for the construction and working of an electric tramway directly from Rome (*via* delle Cave) to Albano, a distance of 12 miles. The Società per Tramways di Livorno has purchased the steam tramway which runs from Pisa to Marina. Electric traction is to be substituted for steam, and the line to be extended to Leghorn.—*Board of Trade Journal.*

A scheme is under consideration for the conversion of the steam railway between Verona and San Bonifacio into an electric line.

Haslingden.—At the meeting of the T.C. on September 29th, Ald. Hamilton mentioned that a conference of representatives of Accrington, Rawtenstall, and Haslingden Town Council had been held on the question of the assessment of the electric tramways. They were all of one opinion. The assessment of the tramways was much more than that of the old steam tramways. Haslingden would appeal to the Assessment Committee, and Rawtenstall would, no doubt, take the same course. Accrington had unsuccessfully appealed to the Committee, and they would now go to the Quarter Sessions. Haslingden would take the same course if unsuccessful.

Leeds.—At the meeting of the City Council on Wednesday, the minutes submitted by the Tramways and Electricity Committee recorded the appointment of a deputation to meet representatives of the Bradford Corporation for the purpose of discussing the question of fares on the through journey between Leeds and Bradford.

Liverpool.—At the meeting of the Tramways Committee on September 30th, Mr. C. W. Mallins, the general manager, reported for the period from January 1st to September 24th that the receipts were £424,175, against £409,157; passengers carried, 91,565,324, an increase of 2,858,889. Total distance travelled 8,933,273 miles, an increase of 161,720 miles.

Japan.—The following information is from the report by H.M. Vice-Consul at Osaka (Mr. E. H. Holmes) on the trade of that district in 1909, which will shortly be issued:—Since the commencement of the year numerous schemes have been brought forward for the construction of electric tramways to various places in the neighbourhood of Osaka, including one to Nara (a town of about 45,000 inhabitants, situated 25 miles east of Osaka, another to Kyoto, on the opposite side of the Government railway to the line just completed, a line for an express tramway service between Osaka and Kobe, and many others. The only one, however, for which a charter has been obtained is a line to Sakai, a prosperous city six miles to the south of Osaka. This line will run parallel to the Nankai Railway to Wakayama, which has already been electrified as far as Hamadera (four miles beyond Sakai), and is shortly to be electrified for the rest of its whole length of 40 miles. The other tramway schemes, however, are hardly likely to mature for several years.—*Board of Trade Journal.*

Rochdale.—The Tramways Committee has approved the agreements with Bacup and Whitworth for the working of the lines in those areas, subject to a few minor alterations.

A letter from the B. of T. has been received by the Committee with regard to the proposed double track in Blackwater Street. They have intimated that, though the scheme did not accord with their regulations, there was no engineering difficulty in regard to it. After some discussion, the Committee decided to postpone the construction of the double track for the present, at any rate.

Rotherham.—The T.C. has confirmed a report of the Parliamentary Committee recommending that powers be obtained to run railless cars in the following districts:—(1) Wickersley, Bramley, Maltby, Tickhill; (2) Whiston, Aston, Swallownest and Aughton; (3) Brinsworth, Tinsley, Catcliffe and Treeton; (4) Laughton, Brampton and Dinnington; (5) Thorpe Hesley; (6) Kimberworth to Blackburn. Also to provide and run motor-omnibuses in the same districts as railless cars; and to extend the Wellgate tramway to the borough boundary on the Wickersley and Northern Roads, and also to Thrybergh village.

Scarborough.—The Scarborough people are a curious blend of inconsistency. The Corporation would not touch municipal tramways with a long pole, consequently a private company obtained powers and laid down a trolley system about six years ago. Since then there has been much growling on the part of the townsfolk that the tramways have spoilt the streets, driven wealthy people away, and that generally they have been to the disadvantage rather than to the benefit of the town. Now the company has announced its intention of discontinuing the service on October 15th for the winter months, and all at once a sudden change has taken place in the attitude of the townsfolk. They must have a winter service, they say, and the tramway company must be held up to its obligations in this respect, whatever those obligations may be, which is a very moot point. The Corporation has taken the matter up, and a deputation has had an interview with the B. of T. and the Parliamentary agents of the Corporation. It has now been decided to state a case to the B. of T., the probabilities being that there will be a conference between the Tramways Co. and the representatives of the Corporation. The desire of the Corporation is to ensure that there shall be a "reasonable" winter service, but the more level-headed members recognise that everything will turn upon the interpretation of the word "reasonable," and that if the Tramway Co. can show that they have provided reasonable facilities which were not taken advantage of, the Board of Trade may decide in their favour. So far as the legal aspect of the question is concerned, there is little by way of precedent to work upon, and the matter doubtless rests upon the interpretation of the Tramway Co.'s Act. The company have never abandoned the service in the winter months before, but the patronage accorded the cars outside the season has been most discouraging. Two years ago, however, the company discontinued the running of the cars on the North Cliff route during the winter, and clauses were then quoted against them and penalties threatened, but the decision of the Board of Trade was that there was no case against the Tramways Co.

U.S.A.—According to *Electric Traction Weekly*, regular freight service has been established through the double tunnel built by the Michigan Central Railway under the Detroit River between Detroit and Windsor, Ont. Preliminary trial runs with freight trains hauled by electric locomotives took place on September 16th, and it is expected soon to run a passenger service. The company is now taking up the work of electrifying the Detroit terminals.

Wallasey.—It is intended, when the next Bill is promoted in Parliament, to insert a clause asking for the withdrawal of the by-law forbidding vehicular traffic on the Promenade, so that a car-line may be laid along the Esplanade between the Egremont by New Brighton ferries. It is contemplated also to run electric tramcars through Tobin Street to the Ferry.

TELEGRAPH and TELEPHONE NOTES.

Australia.—According to recent returns, the telephone circuits in the various States at July 18th, 1910, were as follows:—

State.	Metallic circuits.	Single wires.	No. of exchanges.
N.S.W.	15,852	12,339	140
Victoria	2,326	15,918	55
Queensland	4,147	2,813	61
South Australia ...	2,041	1,895	29
Western Australia ...	4,478	953	42
Tasmania	1,303	1,027	33

Brazil.—The Ministry of Communications and Public Works has obtained a credit of 383,260-milreis (about £24,000) to meet the cost of the construction of a telegraph line from the State of Matto Grosso to that of Amazonas.—*Board of Trade Journal.*

Submarine Telephone Cable.—A lead-covered and armoured 16-pair cable has been laid across Chesapeake Bay, U.S.A., having a length of 5 miles, and weighing nearly 232,000 lb. It shortens the route between Baltimore and Cape Charles by 50 miles.

Wireless Lighting.—According to the *Daily Telegraph*, M. Valdemar Poulsen, who has for a long time made a special study of wireless lighting, carried out a successful experiment on Friday last. "While his assistant stood in one room holding two incandescent lamps, the inventor went to another room and placed his transmitting apparatus in position. On pressing the two contacts the lamps were lighted and extinguished. There was no connection of any kind between the apparatus and the lamps." Whether the lamps were lighted with energy transmitted in the form of ether waves, or whether the latter were merely used to switch them on and off, is not made clear by this report; in the latter case, of course, there would be no novelty.

Wireless Telegraphy.—In connection with a scheme for National Defence, the wireless telegraph station at Liverpool is to be removed to the grounds of the Seaforth Barracks.

The Marconi Wireless Telegraph Co. states that a message from Mr. Marconi, dispatched just prior to his departure from Buenos Ayres, on Saturday, announces his success in receiving, while in that port last week, wireless telegrams transmitted from the Marconi trans-Atlantic stations at Clifden, Ireland, and Glace Bay, Nova Scotia. The transmission was effected direct over the distance of some 6,000 miles, no relay station being employed. The construction of a high-power Marconi station at Punta del Este, Uruguay, is to be proceeded with at once. The European station which will be used for the exchange of radio-telegraphic traffic with South America is situated at Coltano, in Italy, and is now nearing completion.

Experiments were recently carried out in the transmitting of signals to the ground from airmen in flight; Mr. R. Loraine was the aviator, and an apparatus designed by Mr. T. Thorne Baker was employed. Transmission was effected over a distance of about 1 mile.

The Fessenden Wireless Telegraph Co., of Canada, has made a proposal to the Royal Commission on Trade Relations between Canada and the West Indies, relating to an "All-Red" route of telegraphic communication for Imperial defence, and cheaper rates between Great Britain, Canada and the West Indies. The company claims, says the *Evening Standard*, to have succeeded in transmitting messages at a rate of 250 words per minute, and expects ultimately to reduce the trans-Atlantic rate to ½d. per word. On the face of it, the proposal appears to partake of the imaginative character with which wireless telegraphy in the past has so often, and regrettably, been associated.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—October 17th. Telegraph and telephone material, for the Deputy Postmaster-General, Hobart. Commonwealth High Commissioner's Office, 72, Victoria Street, London.

Victoria.—Telephone cable and insulators, for the P.M.G.'s Department in Victoria. See "Official Notices" September 2nd.

November 22nd and 19th.—Telephone cable and testing instruments, for the P.M.G.'s Department. See "Official Notices" to-day.

Tasmania.—October 17th. Telegraph and telephone instruments and material, for the P.M.G. See "Official Notices" September 2nd.

Melbourne.—October 25th.—Deputy Postmaster-General. Electric lighting material (Schedule No. 311). See this column in last issue.

November 2nd.—1,000 25-c.p. metallic-filament lamps. for 110 volts, d.c., for the P.M.G.'s Department in New South Wales. See "Official Notices" September 30th.

November 2nd.—Insulators, covered wire, phosphor-bronze wire, and galvanised-iron stranded wire, for the P.M.G.'s Department in Queensland. See "Official Notices" September 30th.

November 23rd.—Cable, ironwork, pipes, conduits, switchboards, telegraph and telephone instruments, &c., for the P.M.G.'s Department in Queensland. See "Official Notices" September 30th.

Inverell (N.S.W.).—November 14th. Complete electrical plant for the municipality (J. E. Donoghue, engineer, Margaret Street, Balmain).—*Australian Mining Standard.*

Western Australia.—November 1st. Instruments, ironwork, cables, &c., for the P.M.G.'s Department. See "Official Notices" to-day.

Barking.—October 12th. Tramcars, complete with trucks and electrical equipment, for the U.D.C. Henley L. Howard, Tramway Manager and Engineer, Electricity Works, East Street (returnable deposit, 10s. 6d.).

Bolton.—The electricity works engineer is to obtain tenders for a pump for the cooling tower.

Bootle.—October 10th. Alternate tenders for coal for the electric light station for the T.C., for six or 12 months, from November 17th. Borough Electrical Engineer, electric light station, Pine Grove, Bootle.

Chesterfield.—October 10th. Fine slack coal (up to 5,000 tons) for the electricity works of the T.C. R. L. Acland, Borough Electrical Engineer, Chatsworth Road.

Chester-le-Street (Co. Durham).—October 19th. Installation of electric light, power and ventilating fan at the Infectious Hospital, and erection of about 600 yd. of overhead single-phase transmission line with underground connections across main road, for the R.D.C. R. V. Dickinson, clerk, Union Offices (returnable deposit, 10s. 6d.).

Edinburgh.—October 10th. Steam turbines, a.c. generators, condensing plant, and internal parts of cooling towers. See "Official Notices" September 16th.

France.—February, 1911. The Prefect of the Department of Calvados, at Caen, is inviting tenders for the construction and working of a metre-gauge railway, to be operated either by steam or electricity.

Great Western Railway.—October 8th. Stores, including a number of electrical and telegraph items, for the year ending November, 1911. See "Official Notices" to-day.

Halifax.—October 17th. One 1,500-kw. turbo-alternator with condenser, two 750-kw. rotary converters with transformers, and switchboard and platform, for the Corporation Electricity Department. See "Official Notices" September 30th.

Johannesburg.—November 4th. Five electric tramcars for the Municipality. Tenders to Town Clerk. Specification, &c., to be seen at Commercial Intelligence Department of the Board of Trade, London.

Leeds.—The general manager of the Corporation tramways has received instructions to obtain tenders for the supply of stopping-place indicators.

London.—Hackney.—October 13th. 90,000 pairs of white open-type arc-lamp carbons, for the Electricity Department. See "Official Notices" September 23rd.

October 12th.—Electrical installation at the Sherington Road Central Elementary School, Greenwich, S.E. See "Official Notices" September 30th.

Margate.—October 17th. Dust destructor, for the T.C. E. A. Borg, Borough Surveyor, 13, Grosvenor Place.

New Zealand.—December 15th. Installations of wireless telegraphy at Doubtless Bay, Gisborne, Cape Farewell, Sumner and Bluff. See "Official Notices" August 5th.

Spain.—October 12th. The Spanish Post and Telegraph authorities in Madrid are inviting tenders for the supply of 90 tons of bronze wire, 3 mm. diam., and 10 tons ditto, 5 mm. diam.

The municipal authorities of Romeral (province of Toledo) have just invited tenders for the concession for the electric lighting of the town during a period of 15 years.

Swansea.—October 12th. Small steam coal for the Corporation electricity works, for three, six, or twelve months; approximately, 2,300, 3,500 and 7,000 tons respectively. Borough Electrical Engineer.

West Ham.—October 13th. Electric light installation in the Receiving Homes, Aldersbrook Road, Wanstead, N.E., for the West Ham Union. See "Official Notices" September 30th.

CLOSED.

Blackpool.—The Corporation has accepted the tender of the Brush Electrical Engineering Co., Ltd., for a 40-h.p. motor.

Bolton.—The Tramways Committee has accepted the tender of the Hadfield Steel Foundry for points and crossings.

The Electricity Committee has accepted the tender of Mr. T. Greenhalgh for glazing the boiler-house roof.

Cape Town.—In connection with the Union celebrations in Cape Town, the following tenders have been accepted:—Illumination of the Houses of Parliament and Supreme Court Buildings, Messrs. J. M. Horn & Co., £475; illumination of Government Avenue, British General Electric Co., £400.

Derby.—The E.L. Committee of the T.C. has accepted the tender of the Union Electric Co., Ltd., for 50,000 carbons, at 45 per cent. discount off price list.

Grantham.—The Board of Guardians has accepted the tender of the Urban Electric Supply Co., Ltd., for installing electric plant capable of pumping 400 gallons of water per hour from a well to a water-tower tank, with the necessary motor, starter, switches, fuses and wiring.

London.—The L.C.C. has accepted the tender of Pinchin, Johnson & Co., Ltd., for the supply of insulating varnishes for the tramways.

MARYLEBONE.—The B.C. has placed an order with Messrs. S. Williams & Co., at £85, for a coal grab for the generating station.

STEPNEY.—The Electricity Supply Committee recommends the acceptance of the following tenders for coal :—

A. Blackmore & Co.—2,000 tons screened peas, 11s. 6d.
E. Foster & Co.—2,500 tons washed peas, 10s. 7d.; 2,500 tons unwashed peas, 9s. 9d.
G. Hinchliffe & Co.—2,000 tons screened or washed peas, 11s. 6d.; 1,000 tons nutty small, 9s. 9d.

Newport (Mon.).—The Corporation contract for continuous-current electricity meters has been divided between the Electrical Apparatus Co., Ltd., and the British Westinghouse Electric Co.

Salford.—The T.C. has accepted the tender, at £145 10s., of Messrs. J. P. Hall & Sons, Ltd., for a compound vertical steam feed pump for the boiler house at the generating station.

Thorner (Yorks.).—For the electric light installation at the new Parochial Hall, the tender of Mr. Walter Robb has been accepted.

Tweefontein.—*Commercial Intelligence* says that all the plant required for the Transvaal Hydraulic Power Syndicate's undertaking at Tweefontein is to be supplied by the British Electrical Federation.

Whitehaven.—The Electricity Committee has accepted the tender of Mr. David Burns, of Whitehaven, for the electric light installation at Irish Street Schools, with screwed tubing.

FORTHCOMING EVENTS.

North of England Institute of Mining and Mechanical Engineers.—Saturday, October 8th. At 2 p.m. Paper on "Experiments illustrative of the Inflammability of Mixtures of Coal-dust and Air," by Dr. D. P. Bedson, will be open for discussion.

Manchester Association of Engineers.—Saturday, October 8th. Opening meeting of the session. Visit to the University of Manchester, 2.45 p.m. Tea at the Grand Hotel at 5.30 p.m. Inaugural address at 7 p.m. by the president Mr. W. Fox.

Institution of Mechanical Engineers (Graduates' Association).—Monday, October 10th, 1910. At 8 p.m. "Recent Improvements in Wood-working Machinery," by Mr. Albert E. Harris, graduate, of London.

Institution of Electrical Engineers (Manchester Local Section).—Friday, October 14th. Conversazione at the Whitworth Institute. 7.30 p.m. [Tickets from the secretary, Mr. H. W. Wilson, 19, Brazennose Street, 3s. 6d.; ladies, 2s. 6d.].

Junior Institution of Engineers and Society of Engineers.—Monday, October 10th. At 7.30 p.m. At Caxton Hall, Westminster. Lecture on "The Law Relating to Engineering," by Mr. L. W. J. Costello. (Lecture I.)

NOTES.

Electric Shock Fatality.—An inquest was resumed on September 30th into the cause of death of John Peel, an assistant winder, who was killed in the winding-engine house at Denaby Main on the evening of September 20th. According to a report in a Rotherham newspaper, the proceedings were watched by Mr. H. M. Pickering (Chief Inspector of Mines), Mr. Poole (H.M. Inspector of Mines), Mr. Nelson (Electrical Inspector of Mines) and Mr. A. H. Barnard (agent for the Denaby and Cadeby Collieries, Ltd.).—John Edgar Holcroft, a winding engineman at Denaby Main, said he was working with Peel on that evening, and Peel assisted him to draw the "afternoon" men out. About 11.10 he heard an "Oh!" from Peel, and stopped winding. Guided by a faint groan, he went round the engine and found his assistant reclining across the steel fence. There were no signs of life. Answering Mr. Pickering, Holcroft said he had sent Peel to refill the water tanks. The water had to be kept at a certain temperature, and the heat was generated by electricity. Holcroft himself had tested the water with his naked hand, but never when the motor was running, and Peel quite understood that it was dangerous to touch the water when the engine was running.—Norman Walker, an assistant engineer, said if a person put his hand into the liquid when the motor was running he would receive a shock of 360 volts, which might conceivably be dangerous.—Dr. Gardner said a shock of 360 volts was dangerous to life. It was, he believed, capable of producing instantaneous death. Death was due to heart failure from shock.—The jury agreed that Peel had been accidentally killed by an electric shock sustained by putting his hand into the liquid.

Appointment Vacant.—Mechanical engineer for the Shoreditch Electricity Supply Department (£3). See our advertisement pages in this issue.

An Abortive Contract.—The following facts, brought to our notice by the Davis Electrical Co., Ltd., of 17, Moor Street, W., will probably be of interest to contractors and manufacturers of electrical supplies :—Last year the Davis Co. quoted the Isle of Thanet Electric Tramways and Lighting Co., Ltd., of St. Peters, Kent, for their annual supplies of general stores. By reason of the wording of the specification, samples had to be inspected at the stores, St. Peters, which necessitated a special journey there for that purpose, occupying practically a day. The Davis Electrical Co. were in due course informed that their tender for certain supplies had been accepted, but from that day to this they have not been favoured with a single order for the accepted portion of the tender. They addressed a courteous letter to the engineer and manager, pointing out the entire absence of orders, and asking for some explanation, but that gentleman, we are informed, did not even acknowledge the letter. As the Isle of Thanet Co. are now inviting tenders for next year's supplies, the Davis Co. have thought it a very good time to draw attention to their business methods. It can hardly be supposed that a company operating both electricity supply and electric tramways has had no need to purchase stores such as those contracted for during the year; to buy them elsewhere than from the contractor, on the other hand, would be a breach of faith which could not be too strongly condemned. Contractors would do well to stipulate for a minimum quantity to be paid for, whether used or not.

"Ichabod."—There was a time when to be depicted in the cartoons of *Vanity Fair* was an honour worth attaining; when that honour was awarded with discrimination, unbiased by other considerations. Alas! the glory has departed.

Our readers may remember that some years ago we pilloried in our "Notes" a ridiculous "invention"—an electromagnetic gun, which, it was claimed, could throw a 2,000-lb. projectile from London to Paris, but which had no recoil; we pointed out that the most elementary calculations showed this invention to be a dynamical impossibility, apart from the obvious fact that according to one of the claims made for it, it violated one of Newton's laws. This was described in eulogistic terms in an article by a retired colonel of the Royal Engineers, and was attributed to a Mr. W. S. Simpson. To our astonishment we find in *Vanity Fair* of the 28th ult. a portrait of Mr. Simpson, over the legend "Science and Invention"; and in the article on "Men of the Day," that gentleman is belauded as an inventor-poet, a wonder-worker, the inventor of numerous epoch-marking discoveries, including the marvellous gun, "the greatest modern invention in gunnery!"

The author of the article, who writes "missive" for "missile," and "animalculæ," may be pardoned for his want of knowledge of "science and invention"; but there should be some responsible person in authority, capable of discriminating between genuine and groundless claims to recognition as a "man of the day."

Copper.—The reduction on stocks for the month of September, 1910, amounts to 3,545 tons, a considerably higher amount than for the preceding month, or than the average (about 2,500 tons), by which stocks have fallen per month since their highest, in February. The reduction has been entirely in stocks at British ports, French stocks having gained 287 tons, and Australian shipments being higher during the month (8,900 tons afloat for September 30th, against 7,775 for end of August). From South America shipments have increased, supplies both to British ports and the rest of Europe being well up to the average. Spain and Portugal are rather low, and other sources the same. Shipments from Chile are above average, and Australia shows 4,450 tons, against an average of 3,235. Total deliveries are high, 45,987 tons, as shown by Messrs. Merton's circular, being the largest amount for over two years. American stocks are only given up to the end of August. The quantity shows a falling-off of only 781 tons from the preceding month.

Educational Notes.—UNIVERSITY EXTENSION LECTURES.—Mr. Banister Fletcher, F.R.I.B.A., was to commence a course of 24 University Extension Lectures on "Ancient Architecture" at the British Museum, on Tuesday last, and a course of 24 lectures on "Mediæval Architecture," at the Victoria and Albert Museum on Monday last. Full particulars from Miss Gaudet, 120, Cheyne Walk, Chelsea, S.W.

CHESTERFIELD MUNICIPAL TECHNICAL SCHOOLS.—We have received the syllabus for 1910-11, showing that lectures are provided in electric light and power distribution and electricity in mines, by Mr. E. P. Austin, assistant engineer at the municipal electricity works. We understand that the mining classes have been cordially supported by the principal mining companies in the district in recent years.

EVENING CLASSES FOR ENGINEERS ON SHIFT.—The question how suitable provision could be made for shift engineers to improve their knowledge by attendance at evening classes was discussed in our columns at some length last year; the difficulty was that, owing to the recurrent changes of shift, the continuity of the evening courses was constantly interrupted, and would-be students were disheartened.

This drawback has now been entirely removed in the case of Battersea Polytechnic, for we are informed by Mr. A. W. Ashton that he has been able to arrange for day classes in connection with most of the electrical engineering classes, so that students on night shift can attend in the daytime the lectures which they would otherwise miss. We commend this arrangement to the notice of engineers on shift duty, and the authorities of other teaching institutions.

Institution and Lecture Notes.—ASSOCIATION OF CHARGE ENGINEERS.—The programme for the 1910-11 session, which opens next week with the presidential address of Capt. H. Riall Sankey, includes the following papers:—

Wednesday, December 7th.—"Practical Notes on the Working and Control of Steam Boilers," by Mr. J. B. C. Kershaw.

Wednesday, January 11th, 1911.—"Engineering Plant in Institutions," by Mr. A. E. Wheeler.

Wednesday, February 8th.—"Overtype Superheated Steam Engines," by Mr. W. J. Marshall.

Wednesday, March 8th.—"Gas Producer Plant," by Mr. W. A. Tookey.

Wednesday, April 12th.—"Well Boring and Wells," by Mr. W. H. Booth.

MANCHESTER ASSOCIATION OF ENGINEERS.—We have received a copy of the syllabus for the 1910-11 Session, which opens to-morrow, October 8th, with the presidential address of Mr. Wm. Fox. The papers announced for between now and March next include such subjects as water-tube boilers, Humphrey pumps and compressors, motor-cars, condensing plant, large gas engines, and large steam rolling and blowing engines.

On Monday next a course of 12 lectures by Mr. H. M. Hobart, M.Inst.C.E., on "The Design of Continuous-Current Machines," will commence at University College, Gower Street; the hour chosen for the lectures is 5 p.m., it having been found that, at this time the largest classes are obtained, as both the students at the College and young men in business are then able to attend. A similar series of lectures will be given by Mr. Hobart on "The Design of Alternating-Current Machines," later in the session. Each lecture will be followed by one hour's drawing-office work. Particulars can be obtained from Mr. W. W. Seton, at the College.

LECTURES ON THE LAW RELATING TO ENGINEERING.—The Council of the Society of Engineers (Incorporated), in conjunction with the Council of the Junior Institution of Engineers, has arranged for a course of six lectures on "The Law Relating to Engineering," to be delivered by Mr. L. W. J. Costello, at Caxton Hall, Westminster, at 7.30 p.m., on the following dates:—October 10th and 26th, November 9th and 21st, and December 7th and 19th. Applications for tickets should be made to the Secretary of the Society of Engineers at 17, Victoria Street, Westminster; or to the Secretary of the Junior Institution of Engineers, 39, Victoria Street, Westminster.

INSTITUTION OF CIVIL ENGINEERS.—The Council has made the following awards in respect of papers published in Section II. of the *Proceedings* for the session 1909-10:—A. Telford gold medal to Major W. W. Harts, U.S. Army (Nashville, Tenn.); a Watt gold medal to Mr. A. Trewby, M.A. (London); a Crampton prize to Prof. A. H. Gibson and Mr. A. Ryan (Manchester); and Telford premiums to Messrs. W. R. Baldwin-Wiseman, M.Sc. (Southampton); and O. W. Griffith (London), W. E. Lilley (Dublin), W. Corin (Sydney), J. A. Saner (Northwich), and F. O. Blackwell (New York). The Indian premium for 1910 has been awarded to Mr. C. W. Lloyd-Jones (Secunderabad).

CITY AND GUILDS TECHNICAL COLLEGE, FINSBURY.—A special course of six lectures on "India-Rubber" is to be delivered by Dr. P. Schidrowitz at the above college. The first of the series will be delivered on October 12th at 7.30 p.m. A fuller announcement appears among our advertisements.

The Gas Co. and Islington Electric Street Lamps—An Apology.—The following is a copy of a report from the Lighting Committee, dated September 28th, 1910, appearing in the Islington Borough Council's Agenda which will be submitted at 7 p.m. to-day (Friday):—

"We have had under consideration a report from the electrical engineer calling attention to interference with one of the Council's electric lamps by officials of the Gas Light and Coke Co.

"The company's attention has been directed to the matter, and they have tendered a written apology, but we think it desirable that the Council should be made acquainted with the circumstances, as it will be necessary to recommend that legal action be taken against the company if such interference is continued."

Inquiries.—Makers of the "O.T." dry cells are asked for; also makers of fancy cardboard shades, of the "Lamb" blow lamp, and of automatic machinery for turning out chains welded by the electric arc.

The New Laboratory at Dundee.—The new Peters Electrical Engineering Laboratory was formally declared open on Thursday, October 6th, by Prof. Ernest Rutherford. The laboratory was given to the University College, Dundee, by the Misses Peters, in memory of their brother, the late Lord Dean of Guild Peters. The building is of handsome and substantial appearance. The ground floor consists of a large dynamo room at the back, a large alternating-current room, battery room, high-tension and instrument rooms. On the first floor there is a lecture room, a long photometric gallery, and a testing room. The cost was £2,600.

Telegraphic Union.—The international jury which was charged with the duty of considering proposals for a monument to commemorate the foundation of the Telegraphic Union, has decided not to recommend any of the designs for acceptance or reward, but to propose the opening of a new competition.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—MR. W. A. TURNBULL, at present chief assistant electrical engineer to the city of York, was appointed on Wednesday last week resident engineer at the Stoke-upon-Trent electricity works, under Mr. C. H. Yeaman, the chief electrical engineer of the county borough of Stoke-on-Trent.

The staff of the North Road electricity works, Brighton, have presented a case of cutlery to MR. STANLEY GRAVETT on his marriage.

MR. O. B. RICHARDSON having been appointed baths superintendent under the Shoreditch Council, applications are being invited for the post occupied by him, namely, mechanical engineer in charge at Whiston Street generating station.

MR. L. ROMERO has been promoted by the Salford Electricity Committee to the position of Mains Engineer. Previously the title of the position was altered from that of Mains Superintendent, and the minimum salary was fixed at £180 per year, rising by £10 every two years to £230.

Tramway Officials.—The Derby Tramways Committee has recommended the T.C. to increase the salary of MR. F. HARDING, tramways manager, from £275 to £300 per annum; and that of MR. C. BEACH, car-shed superintendent, from £150 to £160.

MR. A. T. LAMBERT, who has been appointed manager of the Corporation tramways department at Maidstone, was on Friday presented with a silver cigarette case and a case of pipes, by the employés of Messrs. W. A. Stevens, Ltd., Maidstone, to which firm he has been works manager.

General.—The Chelmsford staff of Messrs. Crompton and Co., Ltd., have presented a case of cutlery to MR. H. J. HARROP on his marriage.

The Newport (Mon.) Education Committee has appointed MR. D. A. JONES, of Machen, as lecturer in electrical engineering at the Technical Institute.

ON Saturday last, at a smoking concert, the employés of the National Telephone Co. in Cardiff bade farewell to MR. B. WAITE, district manager of the company, and other officials, on their leaving Cardiff to take part in the preparation of the inventory of the company's property prior to its being taken over by the Government. A number of souvenirs were presented to Mr. Waite and his colleagues.

MR. F. PEAKE SEXTON, A.M.I.E.E., who has just resigned the lectureship in engineering at the Central Technical Schools for Cornwall, has started business as an "electrical engineer and scientific adviser" at Clarence Chambers, London Road, Kingston-on-Thames.

MR. G. F. DAVIDSON has resigned his position as manager of the electrical department of Baker Bros., electric light and power engineers, Middlesbrough, after 11 years' service, in order to take up a position as manager for Messrs. Wallis & Watson, of Leeds. Mr. Davidson is to be succeeded by MR. PERCY WARREN. On account of Mr. Davidson's removal, he has been compelled to resign his position as hon. secretary of the Tees-Side Section of the Electrical Contractors' Association. In this office he will be followed by MR. H. C. WATSON, of the Central Electrical Works, Stockton-on-Tees.

MR. J. MEEK, who has been for many years the West End representative of the Edison & Swan Co., and also for some time their representative in the South and West of England, has resigned his position, having purchased the business of Hancock & Rixon, 52, Great Marlborough Street, W., electrical engineers and suppliers.

MR. H. R. TAUNTON, for five years with the Alliance Electrical Co., Ltd., as engineer and branch manager in Glasgow and London, has recently joined the staff of the Edison & Swan Co. as manager of their Publicity Department.

NEW COMPANIES REGISTERED.

Whipple & Co., Ltd. (111,883).—This company was registered on September 24th, with a capital of £2,500 in £1 shares, to take over the business of a manufacturing electrician, electrical engineer and contractor, carried on by C. R. Whipple at Cook Street and Cable Street, Liverpool, as "Whipple & Co." The subscribers (with one share each) are:—C. R. Whipple, 10, Clive Road, Wallasey, electrical engineer; L. Richards, 20A, Chapel Street, Liverpool, tailor; J. S. Williams, 14, Dale Street, Liverpool, chartered accountant. Private company. The directors are to number not less than two or more than four: C. R. Whipple is the first managing director; qualification, 100 shares. Registered office, 9, Cook Street, Liverpool.

Allmanna Svenska Electric Co., Ltd. (111,849).—This company was registered on September 23rd, with a capital of £5,000 in £1 shares, to carry on the business of manufacturers of, and dealers in, electrical, mechanical and other machines, appliances and apparatus, &c. The subscribers (with one share each) are:—S. Busch, Norfolk House, Cannon Street, E.C., managing director; J. L. Fuller, Norfolk House, Cannon Street, E.C., director. Private company. The number of directors is not to be less than three or more than six; the first are J. S. Edstrom, J. L. Fuller, K. Hedin and S. H. Busch; qualification, one share. Registered by Bristows, Cooke and Carpmael 1, Copthall Buildings, E.C.

CITY NOTES.

Dick, Kerr & Co., Ltd.

Mr. John Kerr (chairman) presided on Thursday last week at the Cannon Street Hotel, E.C., over the ordinary general meeting of the above company.

In moving the adoption of the report, the Chairman said that before immediately proceeding with the company's business, he would like to make a brief, perhaps insufficiently brief, reference to the great loss the company had sustained in the tragic death of their managing director, Mr. George Flett. He was killed as the result of a motor accident at Birmingham on July 27th last. Mr. Flett was associated with the company for nearly 30 years, and ever since its formation as a limited liability company had acted as managing director. The shareholders could understand the grief of his co-directors on learning of his sudden death. His early demise, in the fullest business vigour, left them with nothing but one great regret. The directors were most grateful to the many business friends and business competitors who gave expression to their sympathy at the company's loss, but more especially to their high appreciation of Mr. Flett's splendid character as an honourable and high-class business man. To those who had the pleasure of working alongside of him for many years, one and all could bear testimony to his manly and generous disposition. It added to the sadness of the affair to think that certain work he had strenuously toiled at, and laid the foundation of, might so soon materialise, and he would not be there to see the harvest reaped. Mr. Flett had indicated his desire to gradually retire from the more exacting duties of managing director, but little did they expect that his business career would be cut off so early in this suddenly painful manner. To his relatives he was sure they would one and all be prepared to extend their respectful sympathy in their great bereavement. Mr. Rutherford, who had for a number of years acted so ably as assistant managing director, had been appointed managing director. Other arrangements as to the management were receiving the directors' close attention. Regarding the past year, he was sorry to say that the views he expressed at the last meeting, and he might also include the year before, as to the extreme competition in the electrical trade, had proved only too true. Naturally, with a demand none too brisk, prices were likely to rule low, but in many cases figures were quoted by some firms below the cost of production. In times of depression all industrial concerns had to face restricted profits, but there was a point where discretion should cry a halt. Foreign competition also helped to aggravate matters. After three years of dull times, a period seemed at hand when there would in many directions be a great expansion of electrification in this country and abroad. When this was realised, there would, he trusted, be plenty of work for all concerns engaged in the industry. The earlier anticipation of progress in electrification might have been disappointing, but in some respects the delay might prove, after all, of advantage to buyer and seller. The year now being dealt with must be equally a disappointment to the shareholders and the directors. The future was brighter, and without the directors holding too optimistic views, they were of the opinion that the work at present on hand and in prospect made the outlook distinctly encouraging. In a period such as they had gone through, it might be a satisfaction to them to know that in matters of depreciation and other provisions the directors had in no way departed from precedent, and everything had been dealt with in the most careful and conservative manner as in the past. The policy of keeping in reserve a goodly sum in times of prosperity had been fully warranted. The directors felt justified in trenching on the carry forward on this occasion, but it was their earnest hope that it would be the last. Their financial position was one of comfort. As they would see by the balance sheet, they had in bills £22,566, cash £69,950, and investments £139,228, or together £231,744. Regarding the investments, at the price at which they stood in the books, the return was a little over 6 per cent. per annum. There were no points in the accounts requiring special mention. After due consideration, the board decided to take up the manufacture of steam turbines, and arrangements of a satisfactory character had been concluded to make turbines under the Bergmann patents. It was hoped that this departure would be the means of increasing their business in large alternators, for which they had a good reputation. The works had been maintained in a high state of efficiency, and everything was being done to cheapen the cost of production while maintaining the highest standard of workmanship. If he might respectfully suggest it to the financiers of this country, it would be to their ultimate advantage, as well as to the advantage of their industrial concerns, if they could use their good influence to see that as far as possible the money provided by the British investor was expended, as regarded material, in providing employment for their own people. German and French financial methods were an object lesson in this respect. He could not conclude without expressing the directors' thanks to the staff for their zeal in promoting the interests of the company.

Mr. C. T. Cayley (deputy chairman) seconded the motion.

A Shareholder asked whether the chairman could give them any information as to why there had been adverse competition during the past two or three years, in spite of the Board of Trade returns. Was it that some big firm was endeavouring to crush out the smaller concerns, or was it because there was not enough work to go round? He had recently been in Manchester, and had gone into a shop which was not directly competing with Dick, Kerr and Co., and there they had 800 more hands than this time last year; he did not know whether that was because that particular concern was taking work at low prices or not.

The Chairman remarked that he thought there was not enough work to go round, and consequently that accounted for the extreme competition. As to the supposed boom in trade, he believed that it only existed in the mind of Mr. Lloyd George.

The report was adopted.

On the motion of Mr. J. Barber Glenn, a vote of condolence to the relatives of the late Mr. George Flett was carried.

Anglo-American Telegraph Co., Ltd.—The directors have resolved, after placing £5,000 to the credit of the renewal fund, to declare an interim dividend for the quarter ending September 30th, 1910, of 15s. per cent. on the ordinary stock and £1 10s. per cent. on the preferred stock, less income-tax.

South Metropolitan Electric Light & Power Co., Ltd.—The warrants for interest on the 4½ per cent. first mortgage debenture stock for the half-year to October 1st, 1910, were posted last week.

Eastern Telegraph Co.—The directors announce the payment, on October 15th, of dividend at the rate of 3½ per cent. per annum, less income-tax, on the preference stock for the quarter ending September 30th, 1910, and the second quarterly interim dividend of 1¼ per cent. on the ordinary stock, free of income-tax.

Calcutta Tramways Co., Ltd.—An interim dividend of 2s. 6d. per share has been declared.

Brisbane Electric Tramways Investment Co., Ltd.—The directors have decided to pay, on November 1st, an interim dividend of 4s. per share (or at the rate of 8 per cent. per annum) on the ordinary shares, as compared with 3s. 6d. per share last year. In regard to dividends on the ordinary shares, the directors intimate, according to a financial daily, that, notwithstanding a substantial increase in net receipts, their policy is to recommend that the distribution in the immediate future should be restricted to 8 per cent. per annum, and that the surplus profits, after making adequate provision for depreciation, should be reserved for the equalisation of dividends and the general purposes of the company.

Rio de Janeiro Tramway, Light and Power Co., Ltd.—The directors have declared a dividend of 1¼ per cent. on the issued capital stock.

British Columbia Electric Railway Co.—According to the *Times*, the board have issued a circular stating that they have decided to make a further issue of £600,000 of capital, and to offer the same to the preferred and deferred ordinary stockholders. The new capital will be divided as follows:—200,000 5 per cent. cumulative perpetual preference shares of £1 each, at 1s. premium; 200,000 preferred ordinary shares of £1 each, at 2s. premium; 200,000 deferred ordinary shares of £1 each, at 3s. premium.

Halifax and Bermudas Cable Co.—According to the *Financial News*, Mr. S. Skinner presided on September 22nd at the meeting of this company, and stated that the net result of the year's working was an available balance of £5,737, as compared with £3,312 for the previous year. The company's cable had worked efficiently. During the year debentures had been paid off to the amount of £10,000, and that debt was now extinguished.

Cleveland and Durham Electric Power Co.—The directors' report states that the capital expenditure on works during the last year has been £8,811. This small outlay reflects the continuance of trade depression which has retarded the amount of new business secured. The gross profits were £12,942, as compared with £2,098 for the previous year; net profit £2,906, which must be deducted from the debit balance brought forward, leaving a debit of £751 to be carried forward. The connections to the system aggregate 36,283 H.P. This is an increase of 6,434 H.P. connected during the year. In addition 6,600 H.P. has been contracted for, and a number of important negotiations are in hand.

Continental.—Germany.—The balance-sheet of the Hamburgische Electricitätswerke Gesellschaft, of Hamburg, for the last financial year, shows a net profit of £123,459, as compared with £100,349 in the preceding 12 months. A dividend at the rate of 8 per cent. is being maintained.

Dundee, Broughty Ferry and District Tramways Co., Ltd.—At the annual meeting of the shareholders it was agreed to pay a dividend at the rate of 2 per cent. per annum. Ex-Provost Brownlee, who presided, pointed out that the receipts, owing to the bad weather, had fallen by £117, but as there had been a saving on the working expenses of £422, they were able to recommend the dividend.

United Electric Tramways Co. of Monte Video, Ltd.—According to the *Financial News* the results for the first half of the company's current year (ended September) make an excellent showing. The gross revenue for this period has amounted to £257,000, an increase of £25,100, so that for the whole of 1910-11 there will probably be an expansion of about £50,000 in the income from the tramways, most of which should be retained in net revenue.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	Sept. 28	2,963	+ 119	17	26,440	— 69	..	..
Ayr	Oct. 1	586	+ 12	20	8,436	+ 330	8	..
Bath	Sept. 28	1,846	+ 138	39	32,569	+ 1,799	..	..
Belfast	„ 30	8,119	+ 324	26	106,433	+ 5,190	37	..
Birkenhead	Oct. 2	2,261	+ 23	26	29,647	+ 721	13·68	..
Birmingham Corp.	Sept. 24	13,605	+ 420	25	169,965	+ 2,338	56·46	..
Blackburn	„ 28	2,695	— 159	26½	29,320	— 1,164	14·12	·12
Blackpool Corp.	„ 29	3,379	+ 273	..	43,902	+ 2,425	..	..
Blackpool-Fleetw'd	Oct. 1	1,863	+ 189	13	19,711	+ 834	..	..
†Bolton	Sept. 25	2,299	+ 123	26	61,562	+ 23	26	..
Bournemouth	„ 28	3,840	+ 247	25½	52,673	+ 4,601	21·9	..
Bradford	„ 24	10,159	+ 227	26	131,669	+ 4,261	54·81	..
Brighton	Oct. 2	2,138	+ 127	26½	28,892	+ 177	9·5	..
Bristol	Sept. 30	12,557	+ 783	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	„ 23	456	+ 20	38	8,316	+ 59	3·65	..
Barnsley	„ 23	333	— 1	38	6,572	+ 164	..	..
Barrow	„ 23	549	+ 28	38	10,401	+ 1,476	5·37	..
Cavehill	„ 23	206	— 7	38	3,609	+ 162	..	..
Devonport	„ 23	955	+ 203	38	16,312	+ 2,280	8·85	..
Gateshead	„ 23	1,996	+1,010	38	37,539	— 145	11·25	..
Gravesend	„ 23	427	— 48	38	7,978	— 86	6·5	..
Greenock	„ 23	1,308	+ 1	38	24,235	+ 3,004	7·25	..
Hartlepool	„ 23	533	+ 23	38	9,659	+ 632	6·72	..
Kidderminster	„ 23	237	— 1	38	4,357	+ 114	..	..
‡Leamington	„ 23	437	+ 17	38	6,537	— 250	..	..
Merthyr	„ 23	444	+ 22	38	7,946	— 214	2·9	..
Metropolitan	„ 23	16,296	+2,481	38	285,800	+48,919	22	..
Middleton	„ 23	662	— 41	38	12,211	— 744	8·5	..
Mid.Joint Com'tee	„ 23	12,117	+ 202	38	220,029	+ 1,980	..	..
Oldham—Ashton	„ 23	1,134	— 6	38	21,237	— 137	9·13	..
Peterborough	„ 23	245	— 7	38	4,445	— 77	5·31	..
Potteries	„ 23	3,766	— 42	38	66,606	— 830	29	..
Rothesay	„ 23	545	— 1	38	9,276	+ 57	2·75	..
Southport	„ 23	642	+ 11	38	11,560	+ 178	8·17	..
S. Metropolitan	„ 23	1,758	— 31	38	31,823	+ 1,163	..	..
Swansea	„ 23	2,254	+ 200	38	41,515	+ 4,651	12·5	..
Tynemouth	„ 23	580	+ 68	38	10,463	+ 541	3·75	..
Weston-s-Mare	„ 23	461	+ 47	38	6,562	— 12	3	..
‡Worcester	„ 23	642	+ 30	38	10,981	+ 217	5·75	..
Wrexham	„ 23	206	— 37	38	3,714	— 80	..	..
Yorks. Wool. Dist.	„ 23	2,140	+ 117	38	37,686	+ 2,945	17	..
Miscellaneous	„ 23	431	— 13	38	8,367	+ 315	..	..
Burnley	Oct. 1	2,584	— 72	..	..	..	..	..
Burton-on-Trent	„ 3	691	+ 161	26	7,224	+ 155	6·74	..
Bury	„ 2	2,516	+ 118	26½	31,890	— 296	22·5	..
†Cardiff	Sept. 17	2,301	— 4	25	56,691	+ 406	..	..
Carlisle	..	..	..	..	..	..	..	..
†Chatham and Dist.	„ 23	980	+ 104	39	33,525	+ 1,220	14·98	..
Cork	„ 29	1,003	— 70	39	19,248	+ 1,678	9·89	..
Croydon	„ 23	3,443	— 73	..	43,529	+ 3,311	11·25	..
Darlington	Oct. 1	408	+ 34	27	5,415	+ 376	..	..
†Darwen	Sept. 24	233	— 14	25	6,322	— 118	4·36	..
Dover	„ 24	475	+ 20	25	6,131	+ 165	4·75	..
Dublin	„ 30	11,323	+ 181	..	79,430	+ 1,653	54·5	..
Dundee	„ 28	2,591	+ 85	19½	24,044	+ 433	15	..
East Ham	Oct. 1	2,223	+ 231	26½	27,862	+ 939	8.5	..
Exeter	Sept. 30	676	— 16	26	8,908	— 701	5·5	..
Glasgow	Oct. 1	38,303	+3,111	..	315,242	+17,988	97·75	3·25
Hastings	„ 3	2,446	+ 40	..	..	..	..	..
Huddersfield	„ 1	3,797	+ 98	27	46,938	+ 2,254	27·5	1
Hull	„ 1	5,372	+ 220	26	71,082	+ 3,635	14·5	..
Ilkeston	Sept. 28	279	+ 2	26	3,432	— 186	..	..
Ipswich	Oct. 1	927	+ 66	26	12,155	+ 651	10·5	..
†Kilmarnock	Sept. 24	143	+ 4	19	3,001	+ 87	4·25	..
Lancashire United	„ 28	2,685	— 72	39	51,455	— 582	39	..
Leeds	„ 24	14,019	+ 244	25	181,051	+ 5,537	..	..
Leicester	..	..	..	..	..	..	..	..
†Leith	„ 24	617	..	18½	12,297	+ 48	8·7	2
Liverpool	„ 24	22,200	+ 459	38½	424,175	+15,017	113·5	4
‡L.C.C.	„ 21	84,076	+7,510	..	1,047,086	+133,914	133	9
London United	Oct. 1	13,609	+1,048	..	252,297	+10,678	..	..
Lowestoft	..	..	..	..	..	..	..	..
Manchester	„ 1	31,451	+ 214	26	409,018	+ 7,673	183	1
Newcastle	„ 1	7,708	— 42	..	104,723	+ 1,247	14·5	..
Newport	Sept. 24	1,949	+ 48	26	18,095	+ 728	14·5	..
Oldham	„ 25	3,597	— 91	26	48,989	— 975	23·75	..
Pontypridd	..	..	..	..	..	..	..	..
Portsmouth	„ 24	4,463	+ 95	25	57,210	— 1,473	15½	..
Preston	„ 28	1,416	— 70	26	19,367	— 376	..	..
Rotherham	..	..	..	..	..	..	..	..
Salford	Oct. 3	9,553	+ 479	26½	125,791	+ 2,132	..	..
Sheffield	„ 2	12,174	+ 789	27½	163,532	+ 9,693	40	·25
Southampton	Sept. 28	2,257	+ 69	26	29,646	+ 676	..	..
Southend-on-Sea	„ 14	1,615	+ 260	24	16,676	+ 1,738	..	..
South Shields	Oct. 1	1,124	+ 11	26½	15,366	+ 28	..	..
Swindon	Sept. 21	315	— 12	..	3,641	+ 140	..	..
Tyneside	„ 28	809	— 22	18	6,273	+ 326	..	..
Wallasey	Oct. 1	1,900	+ 5	26½	26,074	+ 236	..	..
Walthamstow	„ 1	1,486	+ 175	26	19,764	+ 1,319	9	..
West Ham	Sept. 22	5,027	+ 277	25	62,639	+ 2,669	15·25	·12
Wolverhampton	„ 29	1,857	+ 18	26	24,826	+ 3,213	14·25	1·75
Cen. London Rly.	Oct. 1	11,125	+ 538	13	68,780	+ 3,927	6·32	..
City & S. Lon. Rly.	„ 2	6,193	— 71	13	40,001	+ 165	7·26	..
Dublin-Lucan Rly.	Sept. 30	835	+ 11	13	2,303	+ 126	7	..
G.N. and City Rly.	Oct. 1	2,737	+ 94	13	17,020	+ 591	3·5	..
L'pool Overh'd Rly.	„ 2	2,816	+ 164	..	20,554	+ 323	6·8	4·3
Llandudno-Col. Bay	Sept. 30	716	+ 111	48½	13,414	+ 360	..	..
London Elec. Ry. Co.	Oct. 1	24,390	+ 30	13	150,470	+ 655	21·25	..
Mersey Railway	„ 1	4,061	— 5	13	25,472	+ 313	4·5	..
Metropolitan Rly.	„ 2	34,527	+1,016	..	215,686	+ 6,971	24·5	..
Met. District Rly.	„ 1	21,047	+1,198	..	131,315	+ 8,089	24	..
†Anglo-Argentine	Sept. 30	45,894	+6,823	..	1,725,286	+208,672	..	..
§Auckland	Aug.	15,413	+2,313	8½	30,673	+ 3,370	23·3	1
Bombay (B.E.T.)	Sept. 2	5,433	+ 324	35	94,254	+ 6,496	..	..
§Brisbane	Aug.	21,950	— 47	32	144,795	+13,548	..	..
§Brit. Columbia Rly.	..	..	..	..	..	..	..	..
Calcutta	Oct. 1	7,403	+ 760	..	..	..	..	..
§Cape Electric T.Ld.	..	..	..	..	..	..	..	..
§Kalgoorlie, W.A.	Aug.	3,985	..	..	28,011	..	20	..
Madras	Sept. 30	1,286	+ 22	..	24,322	+ 1,406	..	..
Montevideo	Sept.	21,360	+2,332	..	256,979	+25,096	..	..
§Lisbon	..	..	..	..	..	..	..	..
Perth (W.A.)	Sept. 30	2,583	— 217	..	48,385	+ 6,187	29	1

* Compared with the corresponding period of 1909. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Evening.

It has taken the Stock Exchange a long time to get over the summer holiday feeling, but at last clear indications are manifest that the public begin to take renewed interest in stocks and shares. There is, it must be confessed by any Stock Exchange member, very little to attract or fascinate either class of House business at present, and a catalogue of reasons for depression in the markets might be compiled with only too much ease. In spite of circumstances, however, business is certainly waking up, and the habit of investment begins to return.

The slump in rubber shares is doing a good deal to unsettle other markets, and vague apprehensions of trouble fill the atmosphere, making their presence felt far beyond the immediate sphere of influence. Losses have been so heavy in connection with rubber speculations that to meet them there has had to be liquidation in other departments. The great troubles of the rubber market are two-fold. The first is concerned with the incessant drop in the price of the raw material, and the second has to do with the financial losses just mentioned. Just as the wildest optimism talked rubber to a sovereign per lb. six months ago, the prophets of pessimism now talk it to half-a-crown per lb.

In the Home Railway market the outstanding factor is, naturally, the cotton trade position, which plays upon all stocks in this department, irrespective of their association with the lamentable differences of opinion in Lancashire. On Monday a decided change for the better came over the market, on account of the expectations that the lock-out—even if there were one at all—would be but a temporary matter. The latter developments, however, caused the situation to assume a more serious complexion, and prices went back. Central London Deferred fell a point. Other undergrounds are steady. The Brighton Company is said to be doing extremely well with its electrically-converted section. Underground Electric Railways Income bonds are down a point. The Ordinary shares of the company are quoted nominally at 20s.

Electricity Supply shares are the most high-and-dry (using the phrase in a metaphorical, and not a literally figurative sense) market in the Stock Exchange. A fortnight ago there seemed to be the prospect of a glimmer of public interest striking across the shares, but this quickly faded, and once more deadness reigns. London Electric Ordinary shares have gone back ⅛, and Metropolitan Preference gained a similar amount. Urban Ordinary are *ex* 2s. 6d., and the Preference too, but the prices have not moved from 15s. to 45s. respectively. The Ordinary are in the singular position of giving a remarkable yield on the money at the present time: how long this will be maintained we should not care to prophesy.

The Canadian-Latin group is irregular. Rio Trams have been extremely wild, varying between 102 and 108. At the moment they are 105¼. Mexico Trams recovered rather more than their fall. Para Electric Trams rose again to 7⅞, and the 5 per cent. Debenture stock hardened to 99¼. Canadian General is 110 and 120 for the Common and Preference respectively.

British Columbia Electric Railway stocks show, comparatively speaking, big falls, which are due to the issue of the new shares. These latter, offered at 21s., 22s. and 23s. for the Preference, Preferred and Deferred shares, are being taken up readily by the proprietors, some of whom sold the old stocks to pay for the new securities, so that the quotations of the former are down, on account, not only of their being *ex* rights, but because sales have taken place as well.

Anglo-Argentine Trams are better. London United Tramways Debenture eased off. Metropolitan Electric Trams have gone back again.

Telegraph and Telephone issues are firm, but the market is resting a little after its vigorous advances in the first part of September. Direct United States shares are better, and Anglo-American Telegraph Deferred is a trifle easier. Amazon Telegraphs have receded, but the rise in West India and Panama shares has been resumed with eagerness.

There is a slight fall in National Telephone Deferred stock. Chili Telephones have the largest gain to their credit in this department, being 7s. 6d. higher. Marconi's at 16s. 3d. are unmoved on the news that the inventor, while at Buenos Ayres, received wireless messages direct from Ireland and from Nova Scotia. Stocks and shares in the cable companies whose lines run to South America are also without alteration. Globe Ordinary is ⅛ lower, *ex* 2s. dividend, while the Preference, *ex* 3s., show no change. American Telephone and Telegraph capital stock has gained 4, allowing for the dividend deduction of 2 points. The company is said to be in negotiation with one of the big American telegraph undertakings with a view to amalgamation.

Callender's Debenture stock has gained ½, and Henley's issues are stronger in all three classes. Willans & Robinson's Preference and Dick, Kerr Preference have both declined. Aron Electricity shares drooped to about 11s. 6d. British Westinghouse 4 per cent. Debenture at 62½ is ½ higher.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1906.	1907.	1908.	1909.	Closing Quotations Sep. 27th.	Closing Quotations Oct. 4th.	Business done week ended Oct. 4th, 1910. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	3⅜ — 4⅛	3⅜ — 4⅛	..	..	..	Nil.
286,500	Do. 5 % Deb. Red. Iss. at 98 % script all paid	Stock	5 %	5 %	5 %	5 %	95 — 97	95 — 97	95¾	95	..	4 17 7
255,196,000	American Telephone & Telegraph, Cap Stock ..	$100	8 %	8 %	8 %	8 %	139 —142	141 —147 xd	..	..	..	5 8 10
53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	93 — 95	94 — 96	..	..	+1	4 3 4
558,460	Anglo-American Telegraph	Stock	3¾%	3¾%	£3 4s.	3¾%	67 — 69	67 — 69	..	..	..	5 5 1
3,220,770	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	109 —111	109 —111	110	109½	..	5 7 2
3,220,770	Do. do. do. Deferred	Stock	1¾%	1 %	8/-	25/-	26⅞ — 27⅛	26⅞ — 27	27	26¾	— ⅛	4 12 7
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	101½ —103½	101½ —103½	..	..	..	4 16 7
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	8 %	9⅞ — 10	9⅞ — 10⅛	10⅛	10	+ ⅛	3 17 1
2,449,176	Commercial Cable, Stlng. 500 year 4% Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	85½ — 86½	84½ — 86½ xd	..	..	..	4 12 6
16,000	Cuba Telegraph	10	5 %	6 %	6 %	6 %	8⅞ — 9⅛	8⅞ — 9⅛	9⅛	..	..	6 6 4
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½ — 17⅛	16½ — 17⅛	..	..	..	5 14 3
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3⅜ — 3½	3⅜ — 3½ xd	..	..	..	5 1 7
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8⅞ — 9⅛	8¼ — 9 xd	..	..	..	5 11 1
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	101 —103	101 —103	..	..	..	8 14 10
60,710	Direct United States Cable	20	4⅜%	4½%	4½%	4 %	16⅜ — 16⅝	16⅜ — 16⅝	16⅞	16 9/16	..	4 7 5
36,000	Direct W. India Cable, 4½% Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 8
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	133 —136	133 —136	135	133½	..	5 2 11
2,000,000	Do. 3½ % Pref. Stock..	100	3½%	3½%	3½%	3½%	84 — 86	84 — 86	85⅛	84	..	4 1 5
1,896,706	Do. 4 % Mort. Deb. Stock Red. ..	Stock	4 %	4 %	4 %	4 %	102½—104½	102¾ — 104½	..	..	..	3 16 7
300,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	12⅜ — 13½	12¾ — 13⅜	13¼	12¾	..	5 5 8
752,400	Do. 4 % Deb. Stock..	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	100½	100	..	3 18 5
200,000	East. & S. Afric. Tel., 4 % Mt. Db. Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 —102	100½—102½	..	..	+ ⅛	3 18 1
181,127	Globe Telegraph and Trust	10	5⅝%	5⅞%	5⅝%	5⅞%	10⅜ — 11	10⅜ — 10⅞ xd	10⅞	10⅜	..	5 7 2
181,127	Do. do. 6 % Pref..	10	6 %	6 %	6 %	6 %	13⅛ — 13⅜	13⅛ — 13⅜ xd	13 1/16	..	..	4 7 3
150,000	Great Northern Telegraph, of Copenhagen..	10	20 %	20 %	18 %	..	30½ — 31½	30⅜ — 31½	..	..	..	5 14 8
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	53 — 55	53 — 55	..	..	..	6 15 8
$41,380,400	Mackay Companies Common	$100	3½%	4 %	4 %	4½%	94 — 97	94 — 97	..	..	..	4 7 8
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	75 — 80	75 — 80	..	..	..	5 0 0
394,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	3/16 — 7/16	3/16 — 7/16	..	..	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	6 %	6 %	6 %	6 %	3/16 — 5/16	3/16 — 5/16	..	..	..	6 4 8
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	3/16 — 5/16	3/16 — 5/16	..	..	..	5 8 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	104¼ —105¼	104⅞ —105⅜	104⅞	104¼	..	5 13 9
3,725,000	Do. do. Def. Stock	100	5 %	6 %	6 %	6 %	122 —124	121⅝ —123½	122½	121⅞	— ½	4 17 2
15,000	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	6 %	10 — 10⅜	10 — 10⅜	..	..	..	5 11 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	5 %	6 %	6 %	6 %	10 — 10⅜	10 — 10⅜	..	..	..	5 11 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅜ — 5⅝	5⅜ — 5⅝	..	..	..	4 10 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 —100	98 —100	..	..	..	3 10 0
1,983,593	Do. do. 4 % Deb. Stock Red.. ..	100	4 %	4 %	4 %	4 %	99 —101	99 —101	100¼	99½	..	3 19 3
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid..	1	7 %	8 %	8 %	8 %	1 5/16 — 1 7/16	1 5/16 — 1 7/16	..	..	..	4 14 10
50,000	Do. do. do. 6 % Cum. Pref. ..	1	6 %	6 %	6 %	6 %	1¼ — 1⅜	1¼ — 1⅜	..	..	..	4 7 3
195,955	Do. do. do. 4 % Red. Deb. Stock..	100	4 %	4 %	4 %	4 %	87 — 89	87 — 89	..	..	..	4 9 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	100	4 %	4 %	4 %	4 %	98 —100	98 —100	..	..	..	4 0 0
11,839	Reuter's	8	5 %	5 %	5 %	5 %	7¾ — 8¼	7⅞ — 8 xd	..	..	..	5 0 0
145,955	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	4 9 1
3,042	Submarine Cables Trust..	Cert.	6 %	6 %	6 %	..	133 —136	133 —136	..	..	..	4 8 3
120,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	7⅛ — 7⅜	7⅛ — 7⅜	7⅜	7 7/32	..	5 8 6
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5⅜ — 5⅝	5⅜ — 5⅝	..	..	..	4 7 11
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2½	2½%	2½%	2½%	..	1 1/16 — 1 1/8	1 1/16 — 1 1/8	..	..	..	4 10 2
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	98 —100	98 —100	..	..	..	4 0 0
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930 ..	10	7 %	7 %	7 %	7 %	13⅜ — 14⅛	13⅜ — 14⅛	14	13 13/16	..	4 18 3
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	100—102	100—102	..	..	..	3 18 5
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	1⅛ — 1 5/8	1¼ — 1½	25/-	22/6	+ 3/8	Nil
34,563	Do. do. 6 % Cum. 1st Pref.	10	8 %	6 %	6 %	6 %	9⅛ — 9⅜	9⅛ — 10⅛	9⅝	..	+ ⅜	5 18 6
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	£2 6	15 %	14½%	9¼ — 9⅜	9⅜ — 9¼	9⅜	9¼	+ ⅜	14 18 9
80,000	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	101½—103½	101½—103½	..	..	..	4 16 7

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

640,000	Anglo-Argentine Trams, 5% Cum. 1st Pref. 1 to 640,000	5	..	..	..	5 %	4 13/16 — 4 15/16	4 11/16 — 4 15/16	97/6	95/-	+ ⅛	5 1 3
500,000	Do. 5 % 2nd Pref., 800,000 to 1,300,000	5	..	..	..	5 %	4¼ — 4⅜	4⅝ — 4 11/16	91/3	90/-	+ 1/16	5 9 7
4,465,674	Do. 4 % Deb. Stock	Stock	..	..	4 %	4 %	92 — 93½	92 — 93⅝	93½	92½	..	4 5 7
332,387	Auckland E. Trams, 5 % 1st Mort Deb. Stock ..	100	5 %	5 %	5 %	5 %	103 —105	103 —105	..	..	..	4 15 3
830,000	Babcock & Wilcox, 1 to 830,000	1	20 %	20 %	20 %	24 %	5⅜ — 5⅝	5⅜ — 5⅝ xd	5 7/16	5 5/16	..	4 7 8
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 3/16 — 1 5/16	1⅛ — 1¼ xd	..	..	..	4 0 0
1,000,000	British Aluminium 5 % Mort. Debs. Red.	100	..	..	..	..	..	..	..	..	..	5 9 7
500,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	8 %	8 %	8 %	143 —147	137 —141	139¾	138½	—6	5 13 6
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	6 %	6 %	124 —128	118 —122	126½	119	—6	4 18 4
400,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	110 —113	108 —111	111½	108	—2	4 10 1
233,000	Do. 4½ % 1st Mort. Deb., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 —104	102 —104	..	..	..	4 6 7
212,600	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
133,301	British Electric Traction	10	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
161,437	Do. do. 6 % Cum. Pref.	10	6 %	3 %	1½%	Nil	2⅜ — 3	2⅜ — 3	55/3	55/-	..	Nil
1,473,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	89 — 93	87 — 91 xd	89⅜	..	..	5 9 11
528,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	70 — 75	70 — 75	73½	..	..	6 0 0
100,000	British Insulated and Helsby Cables	5	10 %	10 %	10 %	10 %	6¾ — 7⅛	6¾ — 7⅛	..	..	..	6 17 11
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6 — 6⅛	6 — 6⅛	..	..	..	4 12 4
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
201,579	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 75,000	5	Nil	Nil	Nil	Nil	5/16 — 9/16	5/16 — 9/16	..	..	..	Nil
1,316,353	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	61 — 63	61½ — 63½	62½	..	+ ½	6 6 0
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	Nil	Nil	Nil	0 — 1/8	0 — 1/8	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.. ..	2	Nil	Nil	Nil	Nil	0 — 1/8	0 — 1/8	..	..	..	10 14 4
125,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	37 — 42	37 — 42	..	..	..	17 6 8
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	22 — 26	22 — 26	..	..	..	4 10 0
137,610	Calcutta Trams, 1 to 137,610	5	8 %	6 %	4½%	4½%	4½ — 5	4½ — 5	91/3	..	..	4 17 7
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,330..	5	5 %	5 %	5 %	5 %	4½ — 5⅛	4½ — 5⅛	..	..	..	4 10 11
350,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	96 — 99	96 — 99	..	..	..	5 2 7
35,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	10 %	9⅜ — 9⅞	9¼ — 9⅞	9⅝	..	..	5 5 9
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	4⅝ — 5⅛	4 15/16 — 5⅛	5⅛	97/6	..	4 5 4
300,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	103 —105	103½—105½	..	..	+ ½	Nil
491,222	Cape E. Trams., 1 to 491,222	1	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	7/-	6/6	..	3 19 4
450,000	Castner-Kellner Alkali, 1 to 450,000	1	8 %	12 %	12½%	12½%	3 5/16 — 3 7/16	3 5/16 — 3 7/16	63/6	61/-	— 3/32	4 3 4
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4 %	4½%	105 —108	105 —108	..	..	..	4 12 4
1,890,690	Central London Railway, Ord. Stock	Stock	4 %	3 %	3½%	3 %	63 — 65	63 — 65	..	..	..	4 13 0
554,655	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	84 — 86	84 — 86	..	..	..	4 7 0
554,655	Do. do. Def. do.	Stock	4 %	2 %	2½%	2 %	45 — 47	44 — 46	..	..	—1	6 2 10
1,480,000	City and South London Railway	Stock	2½%	2½%	1½%	1⅜%	27⅛ — 28⅛	27⅛ — 28⅛	28⅛	..	..	Nil
85,000	Crompton & Co., Nos. 1 to 85,000	8	5 %	5 %	Nil	Nil	¼ — ½	¼ — ½	..	..	..	5 17 8
100,000	Do. 5 % 1st Mort. Reg. Debs., 900 of £100, and 901 11,000 of £50 Red	..	5 %	5 %	5 %	5 %	83 — 86	83 — 86	..	..	..	

* Unless otherwise stated, all shares are fully paid.

‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued.*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years.				Closing Quotations Sep. 27th.	Closing Quotations Oct. 4th.	Business done week ended Oct. 4th, 1910.		Rise + or Fall —	Present Yield per cent.
		*	1906.	1907.	1908.	1909.			Highest	Lowest		£ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	6 %	5 %	⅞ — 1	⅞ — 1	..	..	..	5 0 0
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 — 1⅛	1⅛ — 1¼	..	..	— 1/16	5 12 11
271,080	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	6 %	12½ — 13⅜	12½ — 13⅜	..	..	..	4 8 11
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	4½%	2½%	Nil	Nil	1/16 — 3/16	1/16 — 3/16	..	..	..	Nil
17,139	Do. "A" shares, 01—017,139	5	4½%	2½%	Nil	Nil	1 — 1½	1 — 1½	..	..	..	Nil
307,895	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	63 — 68	63 — 68	..	..	..	5 17 8
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	79 — 82	77 — 80 xd	..	..	..	6 5 0
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	1/16 — 3/16	1/16 — 3/16	7/6	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	7 %	1¼ — 1½	1¼ — 1½	..	..	..	9 6 8
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	7⅞ — 8	7⅞ — 8	..	..	..	6 5 0
200,000	Do. do. 4 % Mort. Deb.	Stock	4 %	4 %	4 %	4 %	82 — 86	80 — 84 xd	..	..	..	4 15 3
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	½%	Nil	Nil	3/32 — 1	3/32 — 1	..	..	..	Nil
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	7 %	10¼ — 10⅜	10¼ — 10⅜	..	..	..	6 10 3
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103½	102 —103½	..	..	..	4 16 10
40,000	Henley's (W.T.), Telegraph Works, Ord.	5	15 %	15 %	15 %	15 %	12½ — 13	12½ — 12⅝	..	..	— ⅛	5 17 8
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5⅛	5⅛ — 5 5/16	..	..	+ 1/16	5 4 8
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	107 —109	107⅛ —109½	..	..	+ ⅛	4 2 2
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	10 %	10 %	10 %	10 %	14½ — 15	14⅜ — 15⅛	15 1/16	14½	+ ¼	6 12 3
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	½%	Nil	Nil	13/16 — 15/16	13/16 — 15/16	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	6¼ — 6½	6¼ — 6½	..	..	..	8 0 0
600,070	London United Trams. (1901) 1 to 50,007	10	3 %	3 %	Nil	..	1½ — 2⅜	1½ — 2⅜	..	..	..	Nil
399,930	Do. do. 60,008 to 100,000	10	3 %	3 %	Nil	..	1½ — 2⅜	1½ — 2⅜	..	..	..	Nil
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	3¾%	..	2 — 2⅜	2 — 2⅜	..	..	..	15 0 0
1,649,930	Do. do. 4 % 1st Mort. Deb. Stock.	100	4 %	4 %	4 %	4 %	67 — 71	66 — 70	..	..	—1	5 14 4
5,732,062	Metropolitan Consolidated	10	1 %	½%	½%	1 %	37⅞ — 38¼	37⅞ — 38¼	38¼	37⅞	..	3 5 4
2,640,914	Do. Surplus Lands	100	2½%	2¾%	2¾%	2¾%	65 — 67	65 —67	65⅜	..	..	4 2 1
8,235,000	Do. District	100	Nil	Nil	Nil	Nil	21¼ — 21⅜	21¼ — 21⅜	21 1/16	21⅛	..	Nil
391,337	Metropolitan Electric Trams., Ord.	1	..	..	4½%	5%	3/32 — 7/32	3/32 — 7/32	16/-	15/6	..	5 14 3
314,016	Do. do. Defd.	1	Nil	Nil	Nil	..	1/16 — 3/32	1/16 — 3/32	..	..	— 1/32	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	3/32 — 5/32	3/32 — 5/32	16/8	..	— 1/32	5 9 7
595,600	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	96 — 99	96 — 99	98½	97½	..	4 10 11
$10,823,200	Mexico Trams Co., Common Stock	..	..	..	..	6 %	127½—129½	130—132	130½	129⅜	+2½	4 10 11
$9,000,000	Do. 1st Mort. 50-year 5 % Gld. Bds.	..	..	..	5 %	5 %	97⅜ — 98⅜	97⅜ — 98⅜	98½	97¼	..	5 1 3
245,500	Potteries Electric Traction	1	4 %	4 %	Nil	..	3/32 — 5/32	3/32 — 5/32	..	..	..	..
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1/16 — 1/8	1/16 — 1/8	..	..	— 1/16	7 5 5
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	83 — 85	82 — 85	..	..	..	5 3 6
37,350	Telegraph Construction and Maintenance	12	15 %	17½%	15 %	17½%	35½ — 37½	35½ — 37½	37⅛	..	..	5 12 0
140,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909.	100	4 %	4 %	4 %	4 %	101 — 103	101 —103	..	..	..	3 17 8
1,000,000	Underground Electric Railway, 5 % Prior Lien	..	..	..	5 %	..	103 —104	103 —104	..	..	..	4 16 2
2,800,000	Do. do. 4½ % Bonds	..	..	..	4½%	4½%	92 — 94	92 — 94	93⅜	93	..	4 14 9
4,900,000	Do. do. 6 % Income Bonds	..	..	..	..	..	38 — 40	37 — 39	..	..	—1	..
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	10 %	5 %	Nil	1/8 — 3/16	1/8 — 3/16	..	..	..	..
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	..	6 %	6 %	3 %	1¼ — 1½	1 — 1½	..	..	— ¼	10 0 0
245,495	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	60 — 70	60 — 70	..	..	..	5 14 4

ELECTRICITY SUPPLY COMPANIES.

30,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10%	10 %	10 %	10 %	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	6 15 7
9,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	4 14 11
400,000	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	100 —103	100 —103	101½	..	..	3 17 8
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	3⅜ — 3⅞	3⅜ — 3⅞	..	..	..	6 9 0
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4¼ — 4⅝	4¼ — 4⅝	..	..	..	4 14 9
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅝ — 4⅛	3⅝ — 4⅛	87/6	86/3	..	4 17 0
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	97 — 99	97 — 99	..	..	..	4 2 6
49,436	Chelsea Electricity Supply, Ord.	5	4½%	4½%	4½%	4½%	3¾ — 4	3¾ — 4	..	..	..	5 12 6
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	4 9 1
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	7 %	11⅛ — 11⅝	11⅛ — 11⅝	11⅜	..	..	6 0 5
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11½ — 12¼	11⅛ — 12¼	117/8	..	..	4 19 0
400,000	Do. 5 % Db. Stk.	Stock	5 %	5 %	5 %	5 %	120 —124	120 —124	..	..	..	4 0 8
800,000	Do. 4½ % 2nd. Db. Stk.	100	4½%	4½%	4½%	4½%	99½—102½	99¼—102½	..	..	..	4 7 10
50,000	County of Durham Electrical Power, Ord.	5	4 %	2 %	Nil	Nil	1½ — 2	1½ — 2	..	..	..	Nil
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	2⅝ — 3⅛	2⅝ — 3⅛	..	..	..	7 16 10
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	5 %	5 %	94⅜ — 96⅜	94⅜ — 96⅜	..	..	..	5 3 8
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	7⅜ — 7⅝	7⅜ — 7⅝	..	..	..	6 7 0
55,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅞ — 11⅛	10⅞ — 11⅛	11 1/16	11 1/16	..	5 6 8
400,000	Do. do. 4½ % Deb. Stock	Stock	4½%	4½%	4½%	4½%	104½—107½	104½—107½	106	..	..	4 3 9
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	Nil	Nil	Nil	Nil	3/32 — 5/32	3/32 — 5/32	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	3 %	Nil	Nil	Nil	1½ — 2	1½ — 2	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	75 — 78	75 — 78	..	..	..	5 15 5
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	..	5 %	5 %	82½ — 85½	82½ — 85½	84½	84	..	5 17 0
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	5 12 10
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	5 %	4⅜ — 5⅛	4⅜ — 5⅛	..	..	..	4 11 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
15,000	Hove, 1 to 15,000	5	9 %	8½%	8½%	8½%	7 — 7⅜	7 — 7⅜	..	..	..	5 13 4
$1,376,000	Kaministiquia Power Co., 5 % Gold Bnds.	100	..	..	5 %	5 %	100½—102½	100½—102½	..	..	..	4 17 7
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	8 %	8 %	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	5 10 4
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	93 — 95	93 — 95	..	..	..	4 4 3
11,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	2½%	3 %	..	1⅝ — 2	1⅝ — 1⅞	..	..	— ⅛	4 16 0
70,000	Do. do. do. 6 % Pref.	5	6 %	6 %	6 %	..	4⅞ — 5⅛	4⅞ — 5⅛	..	..	..	5 17 1
382,355	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4⅛ %	4⅛%	4 %	4 %	90 — 92	90 — 92	..	..	..	4 7 7
200,000	Metropolitan Electric Supply, 1 to 100,000	5	8 %	6½%	5 %	5 %	3⅛ — 3⅜	3⅛ — 3⅜	..	..	..	7 8 2
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4 — 4⅜	4⅛ — 4⅜	..	..	+ ⅛	4 17 4
235,000	Do. 4½ % 1st Mort. Deben. Stock	Stock	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
248,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	82 — 85	82 — 85	..	..	..	4 2 4
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	100	5 %	5 %	5 %	5 %	91 — 92	90½ — 91½	91	90½	— ¾	5 9 7
13,585,000	Do. Light and Power Co., Ltd., Common	$100	..	4 %	3½%	4 %	88½ — 89½	88½ — 89½	89½	89	+ ½	4 9 5
$2,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	7 %	7 %	108½—109½	108⅝—109½	109½	109	— ½	6 7 3
12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	100	..	..	5 %	5 %	94½ — 95½	94 — 95	95	94⅜	..	5 5 3
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	96 — 98	96 — 98	..	..	..	4 11 10
130,491	Newcastle-on-Tyne, 1 to 137,500	5	8 %	8 %	2½%	..	3⅞ — 4⅛	3⅞ — 4⅛	..	..	..	2 17 3
137,500	Do. 5 % Pref., 1 to 137,500	5	5 %	5 %	5 %	5 %	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	5 2 7
150,000	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,500	100	..	..	..	5 %	100 —102	100 —102	..	..	..	4 18 0
10,852	Notting Hill Electric Lighting	10	7½%	7½%	7 %	..	12 — 13	12 — 13	..	..	..	5 7 8
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	6¼ — 6⅝	6¼ — 6⅝	..	..	..	5 3 8
119,694	River Plate Elcty. Co. Ord.	Stock	2½%	6 %	8 %	9 %	210—225	210—225	..	..	..	4 0 4
100,000	Do. do. 6% Non Cum. Pref.	Stock	6 %	6 %	6 %	6 %	105—115	105—115	..	..	..	5 4 4
200,000	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	100½—102½	100½—102½	..	..	..	4 17 7
40,000	St. James' and Pall Mall Electric Light, Ord.	5	10 %	10 %	10 %	10 %	7⅞ — 8¼	7⅞ — 8¼	..	..	..	6 1 3
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	6¾ — 7¼	6¾ — 7¼	..	..	..	4 16 7
150,000	Do. do. 3¾ % Deb. Stock Red.	100	3¾%	3¾%	3¾%	3¾%	84 — 86	84 — 86	..	..	..	4 1 5
12,000	Smithfield Markets Electric Supply, Ord.	5	Nil	Nil	Nil	..	1½ — 2	1½ — 2	..	..	..	Nil
65,000	South London Electric Supply, Ord.	4	8 %	4 %	5 %	5 %	2⅝ — 3	2⅝ — 3	56/3	..	..	6 13 4
130,100	Do. do. 5 % 1st Mort. Deb.	100	..	..	5 %	5 %	99 —102	99 —102	..	..	..	4 18 0
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	..	3/32 — 5/32	3/32 — 5/32	..	..	..	Nil
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅝ — 1¾	1⅝ — 1½	..	..	..	6 16 7
224,520	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	98 —101	96 — 99 xd	..	..	..	4 10 11
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	¼ — 1	¼ — 1 xd	..	..	..	20 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	2 — 2½	2 — 2¼ xd	..	..	..	10 0 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	79 — 81	77 — 79 xd	..	..	..	5 13 11
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 808,000	1	..	..	5 %	..	3/32 — 5/32	3/32 — 5/32	..	..	..	5 14 3
100,000	Westminster Electric Supply, Ord.	5	12 %	10 %	10 %	10 %	8 — 8½	8 — 8½	8⅜	..	..	5 11 1
279	Do. do. 4½ % Cum. Pref. (Reduced from 5% since 31st Dec., 1905)	5	4½%	4½%	4½%	4½%	5 — 5½	5 — 5½	5⅛	..	..	4 1 10

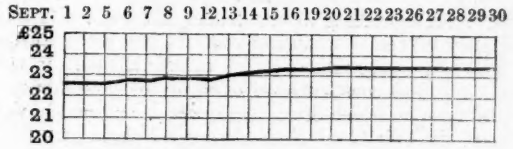
* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

Bank rate of Discount 4 per cent. September 29th. 1910.

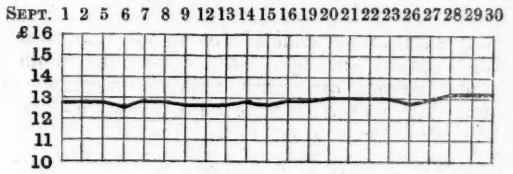
METAL MARKET.

Fluctuations in September.

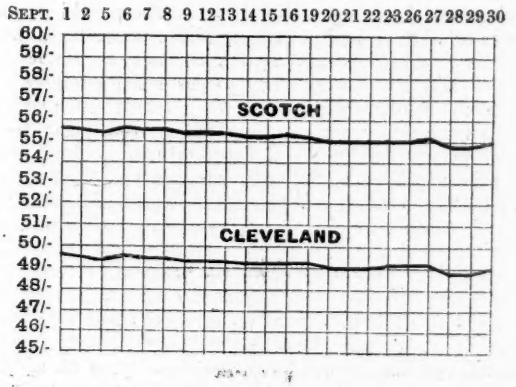
SPELTER (G.O.B's.).



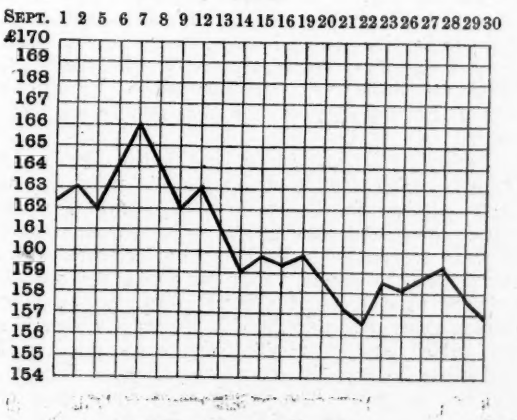
LEAD (ENGLISH).



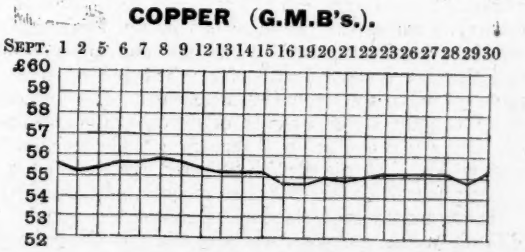
IRON.



TIN.



COPPER (G.M.B's.).



The White City Exhibition, 1911.—At Shepherd's Bush next year there will be a Great Coronation Exhibition, the purpose of which will be to show the dominion, power and immense resources of the British Empire.

HIGH-POWER INCANDESCENT FITTINGS.

The success of the high candle-power metallic lamp is leading to the replacement of arcs in many situations, particularly for the outside lighting of business premises. The electrical contractor is now in a position to offer lamps and fittings which easily compete with gas lanterns in point of first cost and maintenance, whilst avoiding the troubles so often incidental to the use of arc lamps where the attendance is unskilled. Now that it is possible to recommend the tungsten lamp for outdoor use, there is a rapidly-growing trade in the necessary lanterns and fittings, and easy and profitable business can be obtained amongst tradesmen who have hitherto used electricity for interior lighting but relied upon gas for outside use, where a good light is required and the disadvantages of heat and fumes are not serious. The most effective method of canvassing for this class of business consists in offering a free trial of lanterns and lamps to traders who already have the supply in their premises. Owing to the cheapness of the fittings and the strength of the lamps of 100 c.p. and upwards, this enterprise will not be found so expensive in practice as might be imagined, and every order carried out for outside lighting has an immediate advertising value for further work of the same class.

It is well, however, to remember that in order to obtain the best results, and to give the consumer permanent satisfaction, certain principles of illumination and characteristics of the metallic-filament lamp must be recognised, and the design of the lanterns now being offered by firms of more or less experience in electrical work should be considered carefully, as different patterns may vary greatly in efficiency and influence on the life of the lamps—considerations which far outweigh the small differences in price resulting from competition between the manufacturers. The following notes are based upon practical experience in this class of work, and may be helpful to others.

Incandescent lamps may with advantage be exposed to the open air when well out of reach; in such cases they should be firmly attached to the lampholders to prevent movement in the wind. With heavy lamps the pressure of the contact plungers is often insufficient to prevent some rocking on the bayonet pins, and the lamp cap and holder socket should be firmly bound together with tape lapping. For lamps above 200 c.p., an outside globe or cylinder is desirable on account of the large surface of the lamps exposed to the wind; usually a globe is provided, and it then becomes a first consideration to see that adequate provision is made for a current of air to pass over the lamps. Globes should have a fair-sized hole at the lowest point, and above the lamps clear airways through the lanterns leading to openings at the top sheltered from rain and dust by overhanging rims or covers. When the lamps are burning a draught will be induced which will keep down the temperature and greatly lengthen their life. This precaution is frequently overlooked when fitting metallic lamps to well-glass fittings of the watertight patterns. It is now possible to obtain these with holes in the glass and metal cover which secure the needed ventilation, without admitting rain or any appreciable amount of water when washed with a hose.

Large globes are somewhat expensive to make in good flint glass, and when comparing prices this point should be considered, as an inferior globe will stop a very appreciable amount of light; heavy globes should be enclosed in open-mesh wire nets, as is usual with arc lamps, the net being attached to the body of the lantern to prevent glass from falling in the event of breakage. The usual method of securing glasses with three screws is fairly satisfactory, if substantial screws are used and the metal thickened up to receive them. The top opening of the globe should be large enough to allow of its being lowered without tilting to clear the lamps, and it is an advantage to attach it to the lantern body by two light guard chains, which allow it to drop sufficiently to admit the hand for cleaning without risk of contact with the lamps.

The reflector is of importance, for on its form and surface much of the efficiency of the fitting depends, its function being to collect the upward and lateral rays and direct them where required; by the use of correctly profiled reflectors the candle-power and running cost for any given illumination

may be kept down to the lowest value. Considerable attention has been given to this subject in certain types of lantern, and it is important that the position of a lamp with respect to the reflector should not be altered from that provided by the designer; if fitted lower or higher, or a bunch of low-power lamps used in a fitting made for one high-power lamp, much of the effect may be lost.

Reflecting surfaces should be of vitreous enamel, which is permanent and easily cleaned; enamels of the baked varnish or bicycle class are much inferior in reflecting power, and require careful cleaning if they are to be kept in effective condition.

The suspension of window lanterns should be carried out with rigid couplings; when they are allowed to swing freely breakages are more likely to result in windy weather. In certain patterns the lantern is fixed rigidly, whilst the holders are attached by metal springs, so that vibrations of the lantern are damped out before reaching the lamps. When replacing arc lamps, it will often be found that the brackets are far from being plumb—a fault which is not noticed with the freely swung arcs, but becomes very obvious when a row of lanterns are fixed. This difficulty may be met by the use of a levelling coupling consisting of an inexpensive cast cup and ball between the bracket and the lantern, which allows the latter to set itself vertically, when it may be locked by screws.

In recommending incandescent lanterns to tradesmen, the class and arrangement of wares displayed should be considered. Where the windows are shallow and inside lighting is not used, the best results will be obtained with fittings in which a hood or reflector screens most of the light from the street and directs it into the windows; in other cases, the large open lanterns may be preferred as giving a cheerful appearance around the shop. Some experience and observation of window lighting is desirable here, although advice must often be modified by the personal preference of the purchaser, who may hold that a certain style of lighting brings him business—a point of more importance than its beauty or scientific fitness. It is, however, of the greatest importance that the apparatus and arrangement used should be such as to give good and permanent effect without appreciable falling-off in light or undue expense for lamp renewals, the latter being a point of the greatest value in establishing confidence in this comparatively new form of lighting. Attention to the above details will do much to secure these results, and by using large units of light, *e.g.*, a 100-c.p. lamp in preference to two 50-c.p., and a 200-c.p. in preference to four 50-c.p., or even to two 100-c.p., very long life may be obtained, particularly if trouble is taken to instruct the consumer with regard to cleaning, which should be as infrequent as possible, and should then be carried out carefully with the lamps burning.

The cost of this class of lighting may be taken at ½d. per 100 c.p. per hour at 5d. per Board of Trade unit, and under favourable conditions the expenditure on lamp renewals will not exceed 10 per cent. of the cost of energy, even on high-voltage systems.—J. W. B.

UNIFORMITY IN SPECIFICATIONS.

Those engineers who are responsible for the issuing of specifications, and for the carrying out of the work for which they are prepared, are at times apt to wonder, somewhat ruefully, to what extent contractors and manufacturers examine the details of the specifications before sending in their tenders. There is but little doubt that quite a large proportion of successful tenders are not the result of careful estimating for the work to be done, but are mere approximate guesses roughly checked in a few hours, and sent in, in the hope that if the contract is obtained, profit will be made either by over-riding any difficult clauses in the specification, or by obtaining an exorbitant price for any unscheduled extras. It follows, therefore, that in those contracts where the lowest price is of necessity the successful one, the conscientious contractor who allows for all conditions imposed in the specification is often at a disadvantage as compared with his more speculative competitor, and as an instance which recently came to the writer's notice may be mentioned a wiring installation of some £2,000 value, in which case the contractor who offered the lowest price, and obtained the contract, frankly admitted *after the order had been given* that he had not read the specification, had not visited the site, and had prepared the estimate in a few hours just before the latest time for sending in the tender, although a fortnight had been allowed. Examples of this sort are particularly dangerous in cases, such as wiring contracts, where it is impossible to have constant supervision of the work during the whole time in which it is being carried out, and in which defects will only show themselves after some considerable time, when it is difficult definitely to fix the responsibility. It is, of course, to be admitted that firms cannot afford to spend too long in estimating, when the work is of necessity unremunerative in nine cases out of ten, but if this unfair bidding were to be stamped out at the cost of raising contract prices a few per cent., it would be very advantageous, particularly from the customer's point of view, since no work is more unsatisfactory to him than that for which the price estimated is too low. For the consulting engineer, or whoever may be responsible for the specification, the work is doubled in order to keep the contractor up to the mark, unless, as indeed often happens, the former is unable to keep an absolute check on all details, in which case the customer simply gets a cheaper thing, and is worse off than if he had paid a higher price for a better article. This all tends to a greater rigidity in the preparation of specifications, and also to preventing architects and other unqualified persons from being allowed to issue them for engineering work, as they fall a ready prey to the unscrupulous contractor. If firms, estimating for contracts on what might be termed a speculative basis, were made to pay heavily for their temerity, they would soon be driven out of existence, and better prices would be more readily obtained. As a help to bringing about this state of affairs, it would be advisable to make the practice of attaching a schedule of prices to the specification a more general one, since that, at least if properly compiled, has the effect of checking unfair rates for extras, and is particularly advisable for lighting installations, where so many types of additions may be required. The schedule also allows estimates to be checked originally in a very short time, and the only objection to it lies in the fact that it means additional fees to the consulting engineer; but it can honestly be said that it is cheap at the price, and, as a matter of fact, the consultant derives very little profit from this part of his work, since if it be conscientiously done the time occupied is relatively great.

Coming to the question of specifications for machinery and engineering plant generally, the chief point that strikes those who are familiar with both German and British practice is the enormous amount of unnecessary time spent in their preparation in the latter case compared with that occupied in the former. How often does the unfortunate estimater wade through the usual unimportant monotonous clauses, so arranged that the vital clauses of the specification are hidden among ramifications concerning sparking, Matthiessen's standards, and other similar items which he does not wish to read! The remedy is so simple that one is amazed that no very definite step has been taken in this country to realise it. In nine out of ten specifications it would be possible to say: "The machine is to conform entirely with Clauses No. X of the British Standard Specifications, with the following additions and modifications," while in quite a large number of instances the specification could be written down in a sentence: "The machine is to be type No. X of the British Standard Specifications, and is to comply with all the conditions enumerated therein."

To formulate such standard specifications would be no difficult matter, and could easily be added to the tasks of the British Standards Committee, which has already done so much useful work in bringing about uniformity of design in matters where uniformity is desirable. Of course it is not suggested that all specifications could be reduced to a sheet of notepaper, which, it is stated, suffices for the order for a new liner given by the White Star Co. to Messrs. Harland and Wolff, but there is little doubt that they could be very much shortened without in any way allowing loop-holes of

escape for the contractor. In fact, the probability is that a higher standard of work would be reached, since the clauses of standard specifications would be more legally binding, with less liability to dispute as to their meaning.

It must be admitted that something in the direction of standardisation has already been done by the Cable-makers' Association and by the Institution of Electrical Engineers, in issuing certain rules and recommendations, but very little use is made of them, and they certainly only touch on the fringe of the question. In Germany the system has reached a high degree of perfection and works extremely well, and an important fact worthy of note is that the better class of contractors is very much in favour of it, since estimating firms know exactly where they stand and are less liable to be involved in disputes in which they often unfairly have to give way, to prevent their reputation suffering by contact with the Courts, however justified their action may be.

The difficulty with all matters of this type is to obtain influential support for their initiation. The business world is so occupied with its own internal affairs, that it has little time to spare for questions of external importance which cannot show any immediate productive results. Perhaps, however, when the Society of Consulting Engineers is fully formed, something may be done by it to help on this matter, which has a very distinct bearing on the general prosperity of the engineering profession.—A.P.C.

IS HONESTY THE BEST POLICY?

[COMMUNICATED.]

Most of us have been brought up in the belief that honesty is the best policy in the long run, and many young men begin business determined to uphold the reputation of this ancient saw. As they grow older and more experienced, doubts as to the efficacy of strict integrity obtrude themselves, and it is to be feared that a large proportion of them eventually reach a state in which their conduct is only limited by legal considerations—moral obligations being completely ignored.

Before discussing this subject in detail, it is necessary to consider what is meant by "the best policy." If the making of money without incurring the risk of a criminal prosecution be accepted as a fair description of a good business policy, honesty will sometimes be found more of a hindrance than a help. On the other hand, should it be desired later in life to look back over a business career in which the strictest integrity has been the governing factor, there can be no doubt as to the truth of the above quoted proverb in all cases.

Amongst the many types of transaction which a high sense of honour would condemn, the most important is the bribe, whether of the direct monetary description, or in one of the various forms designed to defeat the object of the recent Act. The latter has undoubtedly checked direct payments for orders or favourable opinions, but the system goes gaily on under sundry disguises which in no way relieve such transactions of the dishonest principles underlying them.

It might be thought that the refusal of favours of this description would in time lead to an improved position consequent upon a high reputation for rectitude, at any rate, as regards the consulting engineer. It is very doubtful, however, whether such is the case. The refusal of a favour is apt to arouse a feeling of resentment in the person by whom it is offered, whereas acceptance has a reverse effect. We all feel friendly towards those who accept our patronage, and a firm of manufacturers or contractors who have been able to bestow favours upon a consulting engineer, are much more likely to give him a leg up when they have an opportunity than the expert who has rigidly refused all approaches in this direction.

The same principles extend to cases where commissions are generally considered to be legitimate. An engineer, perhaps, advises a friend or client to apply to a certain firm for special work or machinery, such advice being given without charge. Many people would consider that a commission might be fairly demanded under these circumstances, and it would usually be paid without demur on any orders which resulted. With a view to any future business which may be introduced by the firm in question, the engineer might forego the commission, under the impression that his chances of obtaining the work would be thereby improved. Experience in these matters indicates, however, that the object in view is more likely to be achieved by taking the opposite course, as the payment of the commission impresses the engineer's name upon the memory of the payer, and promotes a friendly footing owing to the bestowal of a favour.

A high sense of honour would prevent the taking of a commission even in cases of this description, and if such a course be deemed dishonest, then honesty is certainly a bad policy for making money under the above circumstances.

It seems to be an almost universal custom in business matters to deny a fault unless it can be proved beyond any possibility of doubt. This custom applies alike to individuals and business firms, and it is certainly the best policy from a "getting on" or money-making point of view. The individual discovered in a mistake always throws the blame upon someone else if it is possible to do so; and if this policy be pursued with discretion it undoubtedly pays. A similar course is practised by manufacturing or contracting firms, where loss would result if a fault were admitted. In neither case can such a procedure be termed honest; and although it is prevalent to a considerable extent, there are fortunately many individuals and firms who refuse to advance their interests in this way.

Extortionate charges, particularly for repair work which is difficult to estimate, is another form of dishonesty, now happily disappearing owing to modern competition, but most of us have witnessed the success of firms whose prices are known to be unreasonable. Customers grumble, but they still bestow their patronage provided that the business be skilfully conducted.

The highest integrity in all business matters would still be the most paying policy if customers or clients became aware of its existence in time to benefit the firm or individual concerned. Unfortunately dishonesty of the type referred to above, is so rife and in the case of illicit favours, so impossible to discover, that credit for business rectitude is seldom obtained, virtue being its own and only reward.

BRITISH TRADE IN RUSSIA.

The British Consul at Kharkoff, in a recent report, states that the advice of Trade journals to British exporters to adapt themselves to local conditions by giving metric measures, price in roubles, in using Russian, German or French in their correspondence and catalogues, is of first importance in the smaller trades, and even the experienced commercial traveller is not in every case the all-powerful trade factor; he can often be replaced by local correspondents. It is not that the commercial travellers are of little importance—machine tools, for instance, are frequently sold by travellers, and in 1909, in the Alexandrovsk manufacturing district alone, the increased demand for agricultural machinery probably brought orders to the amount of about £10,000 to the travellers of a Berlin tool merchant. In this case, personal acquaintance and the patriotic views of the German manufacturers will have assisted to get the orders placed in Germany. The commission agents mentioned above must, of course, be trusted with credit; they need visiting and controlling, and must be supplied with samples and printed matter. The bulk of the various trades that can be handled by the above methods is very large, and should not be neglected. But the trade in which the United Kingdom should be particularly interested, and of which the British manufacturer might gain a larger share—the engineering business—is held by the Germans on a much sounder method, by thorough commercial and technical knowledge, by strenuous energy and financing. In face of a heavy tariff and against the competition of excellently equipped Russian engineering works, they continue to supply machinery which, though of high quality, is probably neither cheaper nor better than the British. In electrical engineering, cranes, lifts, transporters, machine tools, pumps, steam, gas and oil engines and flour-milling machinery, they have a well-established reputation. Some of the firms have their own branches in Russia, with commercial and technical staff; they build factories in Russia or have understandings with some Russian works for the supply of certain parts of the machinery or of the contracts that cannot profitably be imported; they have experienced agents with their own assistant engineer and a staff of experts ready to submit plans and estimates, and, when necessary, to take over the erection; they will keep ready in Russia a stock of machines, such as pumps

or dynamos, and get orders, say, for emergency works in mines, because they can supply more promptly than the Russian manufacturers. Other machines, such as Diesel or gas engines, they can generally supply promptly from Germany; and, finally, they are ready to give credit and guarantees. It wants a large trade to justify such expenses, and any attempt on these lines by a single firm whose goods are not known in the district is sure to be a failure. But what is beyond the power of a single firm may be within reach of a combination.

The use of the German language is only imperative when dealing with the numerous agents that handle the small tool and hardware trade, or with small retailing firms. Business with the latter is only possible with the assistance of experienced travellers, and there are a few rare British manufacturers who adopt this plan. All the more important firms of importers, also the shipping agents at Russian ports, correspond in English, French, or German, according to need. The larger engineering firms, which very generally purchase direct from the foreign merchant or the manufacturer, must be corresponded with according to the nationality of the management. Factories with Russian, Belgian or French management are best served in French. Comparatively few of the large engineering works have engineers who understand English, and German is more frequently needed. Where, however, any special machinery is offered which is likely to find a more general sale, and therefore requires advertising, the advertisement should be in Russian, as it will probably be read by foremen. A good translation and a clear type is wanted, the Russian type used by some British printers being very old-fashioned.

Dimensions of machinery are best given in metric measure, though English inch measure is still frequently used in Russia, and is generally understood. Thus, for instance, Russian rolling mills print their lists in metric and English measures side by side, and use also the Birmingham wire gauge for sheet iron. Many factories still work to the English inch, but in the technical high schools the metric standards are used. The Russian official measure is the arshine (28 English inches), or the sazen (7 English feet) used in the wood trade, in building, and such like. The Russian poud is the commercial standard of weight, and even to the modern Russian engineer comes more natural than the kilogramme. Through freights from British ports to a Russian inland station are also per poud. It is, of course, an easy matter to translate any other system, and the use of the kilogramme or the ton is no hindrance to trade.

In attempting to trade with Russia two difficulties must be faced; the first difficulty is that railways and Government works, the institutions that use the bulk of all engineers' products, are forced by law to purchase exclusively Russian-made goods—from the file to the main engine. Exceptions are only made when unavoidable, but rarely on account of price or of quality. The second difficulty is that trade must be done in face of an apparently prohibitive tariff. Notwithstanding this protective tariff, Russian works manufacturing machine tools and engines are not prospering. Many have closed down, others work with a chronic deficit in this department. The reason is partly to be found in the inexperience of the designing engineers, partly because the necessary high standard of workmanship is, so far, unattainable, but more particularly, because of the limited and irregular demand, which prevents repeat orders or the introduction of more modern designs except by changing costly models before they are depreciated by use. This latter fact at once suggests the class of machinery most likely to sell, and that which it would be waste of money and time to push. Heavy standard-type machine tools, that are no more undergoing constant improvements, are naturally made in the country. Heavy shears, steam hammers, cranes, face plate lathes and machine tools of exceptional weight are very rarely purchased abroad, because of the enormous duty. On the other hand, machine tools that require a high grade of workmanship, or of which the weight is small as compared with the workman's wage put into it, or machines which are being constantly improved, or for which repeat orders are not to be expected, are unlikely to be made in Russia. Under this heading will come bolt screwing machines, turrent lathes, small and multiple drilling machines, and similar light or special machine tools, also high-class engines, high-speed engines, turbine engines and (until now) gas and oil engines. But all these machines should be made as light as is possible consistently with their efficiency, and in every case the quotation should be made without such of the more massive parts as can be easily made after its arrival in Russia. Thus engines are purchased without fly-wheels, oil engines without bed or silencer, lifts without counter-weights, pneumatic hammers without anvil blocks. For these parts drawings and, if necessary, templates or gauges, are supplied by the manufacturers.

Every quotation should contain (besides an advertising description) price and terms of payment, also net and gross weights and shipping dimensions, to enable the prospective purchaser to calculate the cost. This information is very frequently omitted, and causes avoidable correspondence and delay. Prices are generally given f.o.b. British port, preferably Hull, since it is only from there that there is a regular steamship service to Baltic and Black Sea ports. In dealing with firms that are not used to Custom House business, it will be better to give the price free on rail at the Russian port, and also to arrange with the Custom House and shipping agent. German firms generally quote free, duty paid, delivered to customers' inland station. Needless to say, the quotation free on rail manufacturers' station, packing extra, should not be used.

In dealing with Russia, the British engineer is likely to meet with a difficulty that is often doubted—but which is, nevertheless, very real; it is that the managing engineer may be prejudiced in favour of the manufacturers of his own country, and that only very distinct advantages will induce him to purchase elsewhere. Very few will acknowledge this, but it is proved in practice. At the new Russian Co.'s Works, Hughesorka, are to be found a battery of Galloway boilers, British-made rolling mill machinery, and British machine tools. The locomotive works at Kharkoff, financed by French capital, were entirely equipped with French tools. The Maruipol Nicopol blast furnace, rolling mills and tube works have practically the whole of the plant from the United States, being originally in American hands. Unfortunately the British exporter is at a disadvantage compared with French, Germans or Belgians, because British capital has avoided Russia, and there are few factories owned or managed by British subjects.

In regard to the matter of credit, easy terms of payment very distinctly assist trade in Russia. Ready money is not plentiful, and a sale can often be made on credit when the demand for net cash would put the order out of the question. This does not refer quite so strictly to larger machinery for engineering works (though even here it is frequently necessary), as it does to dealings with agents, and more particularly with those referred to above. In every case a strict inquiry into the character and financial standing of the purchasers is necessary. If this is made and the sale department is in the hands of a man experienced in Russia, the money is probably as safe in Russia as anywhere. There are importers who do a very large credit trade in Russia and whose bad debts for any one year do not amount to 1 per cent. of the turnover; but it is not to be denied that much money has been lost in Russia. Bankruptcy laws are very imperfect, payment is easily avoided, and public opinion is very lenient as regards those who refuse payment.

The question of what a British engineering firm has to do to get into the Russian trade, or to increase its trade, is too often answered offhand. Small machine tools that find a regular sale amongst the smaller factories, on estates, &c., are best handled through the medium of wholesale importers and shops that specialise in the sale of technical articles. Such importers are to be found in most commercial centres, more particularly in Moscow. The shops just spoken of are often visited by commercial travellers, who include small machine tools in their lists. Several of the London machine tool merchants travel regularly in Russia. They handle, however, mostly American tools, and it is doubtful if they have found much profit in recent years. Their tools are too expensive for the merchant, and the engineering works seldom happen to want anything when the traveller calls. The first class machine tool importers (and there are several in Moscow and Petersburg who handle also British tools), probably buy without being influenced by a commercial traveller; they will have their regular manufacturers and are not easily induced to handle anything else. Besides, it is doubtful whether they are in a position to do the best for the British manufacturer. Their expenses are heavy, they expect to work with a fair profit and have to keep high prices. Unless they handle a first-class tool and have secured for themselves the exclusive right of sale, the purchaser will pass them over and buy abroad. All works keep a library of tool catalogues; when in need of a tool the manager will consult these and get quotations from the manufacturer direct.

Far better than an importing agent or a casual traveller would be the opening of a sales office, say as a limited company, in one of the centres, best in Moscow, that would combine the interests of a group of British manufacturers, be financed and controlled by these, and managed by a man of trust and experience. The financial arrangement, distribution of expenses and profits could be managed, if only a number of manufacturers were convinced that the trade could be done. The group would have to cover such specialities as high-speed steam, turbine, gas and oil engines, a list of specialities in modern machine tools, also flour milling and foundry machinery, pumps, emery grinders, &c. It should not be necessary to have a stock of machines or exhibition stores in Russia. Such machines as show a regular demand could be kept in bond at the port Custom house. Such a sales office could be relied upon to do a trade and to look after the interests of the manufacturers far more satisfactorily than an agent. And by distributing the expenses over a larger number of machines with a larger turnover, such an office can keep lower prices, it can also control the credits, arrange travelling, advertising, printing matter, see to the supply of those parts that are added in Russia, &c. This proposal for a combined Russian sales office may appear to be full of difficulties. The idea is not new and to get over the difficulties it is necessary to find a group of manufacturers who wish to trade in Russia and are convinced of the incapacities and limitations of travellers and agents. A number of foreign manufacturers have branches in Russia, but they are from that class of manufacturers whose trade demands the assistance of experienced engineers, such as the equipment of flour mills, electrical and heating engineers, transporters or aerial railways and such. They will supply plans and estimates and superintend the erection. In some cases, as for instance, in electrical engineering or light railways, such branches will work in conjunction with a Russian factory which supplies those parts in the contract which cannot be imported. A question that British engineering firms must answer before embarking on the proposed venture is what is the present extent of the Russian market for foreign manufacturers, and what are the prospects of future development. As regards the present position of the trade in machinery, the imports of machinery and implements of all kinds and their parts during 1908 were valued at £8,271,000, as against £6,846,000 in 1907, and £6,011,000 in 1906. The imports in the first 11 months of 1909 were £9,660,000.

Brazil.—The plans for the electrification of the Victoria-Diamantina Railway as far as Itabira do Matto Dentro have been approved.

THE MUNICIPAL TRAMWAYS CONFERENCE.

Lubrication of Car Bearings.

Abstract of report prepared by E. Cross (Rotherham), R. L. Acland (Chesterfield), P. J. Pringle (Burton-on-Trent), T. R. Smith (Leicester).

A discussion was introduced on the subject of the lubrication of car bearings by Messrs. Cross and Acland before the members of the Managers' Section of the Municipal Tramways Association, at Chester, in May last. This subject appeared to be so interesting to the meeting that it was decided by the Executive Committee to ask the authors to form themselves into a Sub-committee in order to obtain information throughout the country for purposes of comparison, and also to put forward recommendations from the information so collected.

A list of questions was compiled and issued by the Sub-committee for the purpose of obtaining as much information as possible on the subject of lubrication of car bearings, and the response should not only prove of interest so far as the title of this report is concerned, but from a general all-round standpoint.

The Sub-committee had for their object in compiling these questions the eliciting of as full information as possible on the following points, viz. :—Class of lubricant used in every case and how applied, first cost and life of medium for conveying lubricant to bearings, cost of lubricant, intervals of inspection and cost thereof, horse-power of motor, description of bearings and of what composed, amount of wear in bearings, cost of renewals of bearings, and particulars of cost and life of pinions and gear wheels.

Class of Lubricant.—It is interesting to note that the use of oil appears to be finding more favour, for out of a list of 56 tramway undertakings there are 16 towns using oil throughout, while 33 towns are using oil partially, and only 7 towns are adhering solely to grease.

Description of Application.—The method most favoured for application where oil is used is the usual spring pad for the lubrication of armature and suspension bearings. In other cases siphons are used, and in several instances steel and wool waste, moelline, elastic packing and the splash system find favour relatively in the order in which they are placed. With regard to axle bearings, pads are used to a very great extent, while Armstrong oilers figure largely, and in some cases wool, hair, and steel and wool packing is used.

Cost of Lubricant.—The price per gallon paid for oil varies from 5½d. to 2s. A number of undertakings use oil at a price varying from 8d. to 9d. per gallon, and there is also a fair number paying 1s., 1s. 2d. to 1s. 6d. and 1s. 9d. per gallon. The highest price paid for grease appears to be 18s. 6d. per cwt., others pay 17s. 6d. and 16s., but the usual price appears to be about 12s. 6d. per cwt.

Intervals of Inspection and Replenishing.—There seems to be a considerable advantage in the use of oil so far as the amount of labour required for inspection and replenishing is concerned. Where grease only is used, the necessary period of inspection appears to vary from once each 24 hours to twice per week. Where oil is used, the intervals between examination vary from twice a week to once a week, and four weeks, and, in one instance, six weeks, is not considered too long a period for the bearings to run without examination.

Cost of Inspection and Replenishing per 1,000 *Miles.*—The replies vary greatly, the lowest cost experienced being 2·29d. per 1,000 miles, and the highest 2s. 10d.

Description of Bearings.—White metal-lined bearings find most favour, but there seems to be a considerable variety in the character of the alloys; only seven undertakings use solid bronze bearings unlined.

Miles per $\frac{1}{16}$*-in. Wear Measured Across Vertical Diameter.*—The information given under this head is considered to be of the utmost importance, and it is interesting to note the number of miles which can be got out of bearings in different towns. As an instance, the following short table of half-a-dozen experiences helps to show the remarkably diverse character of the results obtained :—

A.	Miles per $\frac{1}{16}$ in., wear armature	5,300	Suspension,	—
B.	,, ,, ,,	5,000	,,	6,000
C.	,, ,, ,,	3,000	,,	—
D.	,, ,, ,,	51,000	,,	16,670
E.	,, ,, ,,	38,500	,,	45,000
F.	,, ,, ,,	38,000	,,	114,000

Life of Bearings in Miles.—The life for armature bearings varies from 84,000, 55,000, 50,000, down to 5,000, but the average life appears to be between 10,000 and 12,000 miles.

Gear Lubricant.—There are eight towns who are using oil for the purpose of lubricating gears : the remainder use grease at about from 14s. to 16s. per cwt.

Life of Gear Wheels.—The life of gear wheels varies considerably in different towns, although the conditions are similar, and the class of gear wheels used are identical, with few exceptions. There is a reply which states, "None worn out yet." Another answer states, "None worn out after 5½ years' use," the lowest mileage obtained being 52,506. Lives of 250,000, 200,000 and 160,000 seem to be fairly common, but many undertakings have had to be satisfied with mileages well under 100,000.

Life of Pinion Wheels.—The lowest mileage obtained is 5,000, but there are instances where a mileage of 165,000 to 155,000 has been experienced. The bulk have had to be satisfied with from 70,000 to 40,000, while there are many well under the lower figure. It is interesting to find that specially hardened pinions have not found a place in the higher mileages, the best result obtained being 112,000 miles, but this figure stands quite by itself, other results being much lower.

General—From the consideration and summarising of the foregoing particulars, the subject of "Lubrication for Car Bearings" has assumed far greater importance to each member of the Sub-committee than the mere question of the cost of oil per gallon, grease per cwt., or cost of pads, as the consideration of these costs falls into absolute insignificance compared with the benefits which may be obtained in other ways by a well-designed system of lubrication. Hitherto the provisions made for lubrication have been of the crudest design, and were of such a wasteful character that it was deemed economical to use the cheapest oil on account of heavy leakages, the only other alternative being the use of grease, for the apparent reason that it was not likely to be often in a liquid state, and the loss through leakage was therefore minimised. The Sub-committee have been struck with the remarkably short life of bearings in connection with traction work, and even the best instances recorded are short compared with those of stationary motor bearings under equally disadvantageous conditions with respect to heavy intermittent working. In comparing these types against each other there is one adverse circumstance under which the traction motor has to run, as compared with the stationary motor, and it seems that this explains how the comparatively short life of the traction motor bearing is brought about. Take, for example, a motor driving a heavy crane in an engineering shop, where the atmosphere is fairly loaded with dirt, and still under these circumstances bearings have been known to last for a great many years. In the case of the traction motor, when the car is running, there is a large amount of grit and dirt of the hardest kind, made up largely of fine particles of granite dust surrounding the motors, and unlike the engineer's shop, these particles are not floating about and allowed to fall by their own gravity, but they are driven by a pressure varying with the speed of the car, into any interstices that may present themselves. Consequently, as the present oil or grease chamber is by no means rendered airtight, the grit finds it way into the oil or grease as the case may be.

Formerly, the greaser was considered to be a man of least importance on the tramways' staff, and his job suitable employment for the half-witted, this important work being carried out at dead of night, with little or no supervision, and by those who could scarcely be expected to understand the importance of keeping grease or oil and grit complete strangers to each other. In addition to these disadvantages, it was found necessary to examine and replenish daily, which had a tendency to increase the evil rather than prevent it, which was, of course, the intention. The Sub-committee are of opinion that a system of ring lubrication or its equivalent should be insisted upon in all new motors, and their tangible reason for this recommendation is the already excellent experience of those few undertakings who have had these motors installed for sufficient time to give a decided opinion. Moreover, the evident advantage of such a system is shown by the fact that as the oil ring is to be relied upon to feed with an ample and generous supply, it does not become necessary to inspect or replenish so frequently, and an allowance of six weeks between inspections is not considered to be too daring. With the "ring" system the wasteage of oil is practically nil, and consequently a higher grade of oil can be used without affecting the cost materially, therefore, with the reduced number of inspections—which by the way would be carried on in the daylight under proper supervision—it would then be well worth while to properly joint all inspection doors in such a manner as to hermetically seal the oil well and bearing.

Given conditions similar to the forgoing, the Sub-committee are of opinion that even the best results now obtained should be far surpassed in the future, and should bring the cost per running car-mile down in an agreeable manner by favourably affecting a number of items under that head. It may be of interest to know that two members of the Sub-committee (Messrs. Cross and Pringle) had been previously experimenting, quite independently and unknown to each other, with a system of chain lubrication adapted to the older type of DK motor, so as to improve the lubrication of these motor bearings and to obtain the advantages of the "ring" system as far as possible under the conditions. Mr. Acland is also carrying out experiments with his Westinghouse (46 M type) motors in a similar direction. Some degree of success has already been attained, and the Sub-committee have reason to believe that the experiments will end satisfactorily. Replies to the queries have been of a most diverse character, and it would seem that some form of standardisation would be an advantage in the methods adopted in connection with lubrication of car bearings. Take, for instance, the cost of lubricant, the L.C.C. pay 5½d. per gallon for oil, while Glasgow pay 2s. The Sub-committee lay particular stress on the inadvisability of using grease, or a combination of grease and oil, the latter being particularly objectionable on account of the liability of the grease to mix with the oil and so render the pads or other conveying medium inoperative. There is a divergence of opinion as to the most suitable metal to be used for lining bearings, and consequently there is a great difference in the cost per thousand miles in the results under practically similar running conditions. It will prove to be most valuable information for all members to know how Glasgow and Keighley have been able to run their cars without renewals of gear wheels from the commencement. With regard to pinions, Glasgow obtains 150,000 to 200,000 miles. Information as

to these results cannot fail to be of considerable interest. It appears to the Sub-committee that if co-operation between all undertakings was established with regard to the subject of this report, it might be that an undertaking, although having an excellent experience on the one hand, but unfortunate in other respects, would receive benefit by an interchange of ideas, and thus arrive at the good results obtained by undertakings in other directions. For instance, why should not any undertaking obtain 51,000 miles per $\frac{1}{16}$ in. wear on armature bearings, as in Rotherham? 27,000 miles for suspension bearings as in Belfast? 106,500 miles for axle bearings as in Lincoln? And the excellent mileages obtained by Glasgow, Bury, and Keighley, in respect to gear and pinion?

Discussion.

The discussion was opened by Mr. C. W. Hill, Bournemouth Tramways, who said that the cost of cleaning cars was much more than for oiling, and it obscured the latter. It was possible that at Bournemouth some £300 per annum could be saved if advanced methods of dealing with lubrication, &c., could be adopted. The replies on which the report was based showed such varying results that it was evident that local conditions were an important factor. He was surprised that grease was used, especially with oil, by some people, and a discussion on oil did not appear likely to help matters. The price paid for oil varied very much; he thought cheap oil would let one down and dear oil was too costly, and it appeared that each undertaking must find a suitable oil for its own use. The controlling factor in the life of a bearing was dirt; the present oil boxes were receptacles for dirt. In opening a motor case it often happened that dirt fell inside, and it was evident that ring lubrication would prove better than the present arrangements. One found very wide results in the data relating to gears, and it would have helped if information as to the weight of the cars had been included. It did not appear that case-hardened pinions were any improvement on ordinary ones.

Mr. Blackburn (Manchester) commented on the varying results. The 2·29d. per 1,000 miles, "cost of inspecting and replenishing bearings" seemed to require explanation, also as regards "miles per $\frac{1}{16}$ in. wear": Town D, the suspension bearings had a short life compared with armature bearings.

Mr. E. Cross, in replying, said that the subject had not yet had full consideration.

The Comparative Durability of Brake Shoe and Tires.

Abstract of paper by J. W. Dawson, A.M.I.E.E.,
Assistant Engineer, Bradford Corporation Tramways.

Until quite recently no systematic tests appear to have been carried out to demonstrate the relation between the material of the shoe and its effect upon the tire, and to indicate which type of shoe should prove most economical in use.

Laboratory and service tests have been extensively carried out by the Master Car Builders' Association of America; the results are, however, not applicable to the conditions prevailing in this country. In the United States of America, power brakes are almost universally used on cars, and speeds are high. The tests have naturally been to determine the most suitable shoes for their requirements, and carried out on steel tires with high pressures per square inch of shoe, at a speed of 65 miles per hour. Until last year they had not attempted to ascertain wheel wear, stating in their report—Vol. 41, 1907, Master Car Builders' Association, page 142, par. 10:—

"A Missing Factor.—It is a matter of regret that no measure has yet been made which will disclose the wear of the wheel under the influence of the shoe. To secure such a measure, it will be necessary to have a balance of sufficient capacity to weigh the wheel, and of such delicacy as to indicate differences in weight as small as one five-hundredth part of a pound. No such balance is now available at the laboratory. The possibility that some of those which show high performance in the accompanying diagram may have been protected from wear at the expense of the wheel, makes it highly desirable that precise information be had upon this point."

They have now constructed such a weighing machine, and have carried out tests with several of their approved shoes during the past year. In their report (Vol. 35, No. 26, page 1099, *Electric Railway Journal*, they state:—

"After consideration, the Committee has concluded that no serious wear of the wheels is to be expected from any of the shoes now in ordinary service, and it therefore considers any recommendations concerning wheel wear to be unnecessary."

While these conclusions may be correct for the shoes and conditions ruling with them, the tests which are detailed in this paper show clearly that considerable tire wear is effected by many of the shoes in use in this country.

Brake Shoes.—Twenty different grades of shoes have been tested; they were chosen to cover the range of shoes in actual use in this country. A few shoes have been obtained of special metal, in order to complete the series of grades. The shoes have been cast of a similar pattern to enable them to be tested on tramcars with equal equipments and weights for service tests. The shoes were numbered when received, and may be classified as follows:—

No.			
1.	Soft grey cast-iron	Average hardness	47
2.	" "	" "	46
15.	" "	" "	41
14.	" "	" "	38
16.	Hard grey cast-iron	" "	51
6.	" " stated to have ends chilled, but this was not found to be so when tested for hardness	" "	43
5.	Mottled grey iron. Intermittent chills	Unchilled metal	49
		Chilled "	63
19.	Part chill. The whole face was chilled with about 1½ in., which was unchilled	Unchilled metal	34
		Chilled "	70
7.	All face chill	... ...	66
8.	" "	... ...	74
18.	" "	... ...	64
20.	" "	... ...	66
4.	Hard white iron	... ...	61
23.	" "	... ...	62
24.	" "	... ...	75
9.	Mottled cast-iron body with three white iron inserts	... Body metal	46
		... Inserts ...	56
17.	Mottled cast-iron body with soft steel inserts	... Body metal	55
		... Inserts ...	28
21.	Mottled cast-iron body with soft steel inserts	... Body metal	66
		... Inserts ...	30
22.	Mottled cast-iron body with expanded steel inserts	... Body metal	60
		... Inserts ...	44

The last column gives the average hardness of the shoe face after the frictional tests.

Reproductions of shoe fractures show better than any written description the grade of the metal from which they have been cast, together with the depth of chill and type of inserts. The fractures vary in outline according to their positions in the shoes, they were chosen to represent as nearly as possible the average of each shoe.

Service Tests.—Comparison of the life of brake shoes and tires on one tramway with those obtained on other tramway systems is of very little value, so many factors operating which entirely vitiate the results, such as difference in gradients, nature of the road grit, track brakes, speed, average number of stops per mile, use of rheostatic or magnetic brakes for service stops, &c., but comparison of various grades of shoes can with advantage be carried out on the cars of any one system. The results will not, of course, be of quantitative accuracy, but will give an indication of the difference between, say, a standard brand of shoe and other types used at the same time. For the purpose of comparing results obtained with shoes on tramcars under service conditions with those obtained in the works laboratory under uniform conditions, tests have been made by this method. In service tests, one particular make of shoe was adopted as the standard for comparison. One standard shoe and one with which it is to be compared being fitted to the wheels at one end of the car, and similar shoes fitted at the other end, the same grade shoe being at diagonal positions on the truck, one of each grade of shoe thus acting upon each axle and making the retarding effort per axle equal, the shoes being accurately weighed before fitting. The car is run until some of the shoes are worn out; they are then taken off and again weighed. The amount of metal worn from the test shoes to that worn from the standard shoes will be in inverse proportion to their durability when run with equal pressures upon each shoe; but it must be particularly noted that the shoes with the highest coefficient of friction will have done the most work, so this method of testing is decidedly favourable to shoes having the lowest coefficient of friction. If the circumferences of the tires are measured before and after the test, it will be ascertained which shoes have caused the greatest tire wear. Average measurements from several cars should be taken. Results obtained by this method are shown, as follows:—

Service Tests of Shoe and Tire Wear.

No. of shoe.	Description.	Wheels. Miles per ⅛th radial wear.			Shoes. Miles per lb.		
		Test shoe.	Standard.	Ratio.	Test shoe.	Standard.	Ratio.
4	Cast white shoe ...	6,060	10,954	·55	966	447	2·16
9	Cast-iron with white iron inserts	12,665	9,900	1·30	296·7	722	·41
15	Cast soft grey	14,307	5,830	2·45	214	834	·26
2	Cast soft grey	14,630	8,955	1·63	181	5,332	2·94

Comparison of these tests with those obtained with the test apparatus under laboratory conditions proves that the results obtained on the latter correctly indicate the comparative wearing properties of shoes and tires when run under ordinary service conditions, with the exception of shoe No. 4, of which mention is made later. Shoes Nos. 9, 15 and 2 give results of the same character in both tests. Examination of the table shows very clearly that by this method of comparison the life of the standard shoe varies with the coefficient of friction of the shoe with which it is run. All the

shoes in one set have equal pressures applied during braking, therefore, those having the highest coefficient develop the greatest amount of retarding force. Each set of shoes must stand to itself, and can only be compared with other sets indirectly, say, by means of the percentage or ratio of the test shoe to the standard. Differences of tire wear by various grade shoes are very noticeable. The author is of opinion that one cause of the differences in wheel diameters, so prevalent on tramcars, may be the use of brake shoes of uneven grades.

Another method is to fit up a number of cars with test shoes, keeping a record of their mileage and loss in weight, also records of standard shoes on similar cars running concurrently on the same route and schedule if possible. This test, to be of value, should extend over a long period, in order that running conditions may reach an average.

To accurately obtain comparative results of shoe wear and differences of tire wear, it is absolutely necessary that each shoe should give the same retarding effort. To do this, the pressure applied to each shoe must be in inverse proportion to its coefficient of friction. This has been secured by means of the brake gear designed by the author. In use, shoes of equal grade are fitted on each pair of wheels. The leverage-ratio of the brake gear is adjusted by means of the links between the supplementary brake beams, in proportion to the respective coefficient of friction of the shoes, thus obtaining from each pair of shoes the same retarding effort.

A car fitted with this gear has been running in ordinary service for a few months, with shoes having different coefficient of friction respectively on each pair of wheels. So far, only one grade of shoe has been tested against the standard, the results up to date corroborate those of the laboratory tests. The shoe adopted as standard for the purposes of these tests has chills on face and back so arranged that about one-third of the shoe is chilled. The amount of chilled and unchilled metal is approximately equal throughout, arranged to give a uniform rate of wear and coefficient of friction during its life.

To form an accurate estimate of the value of a shoe from results of road tests is practically impossible, due to conditions stated in the Master Car Builders' Association Brakes Report of 1907, p. 176, viz. :—

"An unsteady wheel pounding along over an uneven track, more or less elasticity in brake beams and brake connections and fluctuations in braking pressure, coupled with the varying contact between wheel and shoe with extremes of climatic conditions from cold to hot, and wet to dry."

To obtain standard and comparable results it becomes necessary, therefore, to carry out the tests with a true wheel revolving at a constant rate of speed with a steady braking load, and a uniformly clean surface.

Laboratory Tests.—For the purpose of carrying out tests under known conditions, the apparatus illustrated in fig. 1 has been installed, consisting of a 30-H.P. tramways motor, driving through

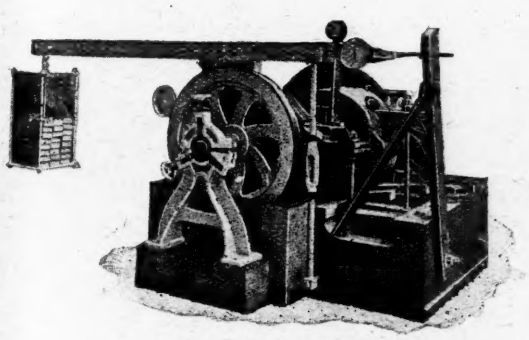


Fig. 1.

the usual single reduction gear, an axle upon which is mounted a wheel-centre with steel tire. The shoe is pressed upon the wheel by means of a lever carrying at one end a pan, which can be loaded with weights, and at the other an adjustable radius rod and a dynamometer for registering the pull upon the shoe. A pulley running upon the tread of the wheel drives a speed and mileage indicator. The apparatus is similar to that used in connection with the brake shoe tests for the Municipal Tramways Association Brakes Sub-Committee, and illustrated in their report.

For measuring tire wear an apparatus designed by the author is used. It consists of a means for determining the difference of volume reduction over a pre-determined area of the tire surface, this by calculation giving the total amount of tire removed. The apparatus is illustrated in fig. 2, and comprises a die with means for forcing its inner face to a fixed radial distance from the centre of the wheel, the distance being determined by the outer faces of the die being in contact with two side faces of the tire. In operation a piece of ductile metal (lead) is placed under the die which is then forced on to a turned face on each side of the wheel, the inner face of the die will thus be a fixed distance from these faces, and the thickness of the lead will be equal to the distance between the inner face of the die and the surface of the tire, the lead following exactly the conformation of the wheel face. In the die are two small recesses, which form projections on the back of the test pieces. These projections enter into holes in the block of the cutting die, ensuring accurate cutting of the test pieces. After being removed from the die, the test pieces are cut to 0·5 in. wide, a test piece being taken at the beginning and close of each run. These cut pieces are weighed on a chemical balance, the difference in weight

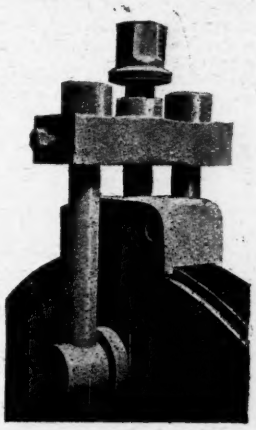


Fig. 2.

of the two pieces equals the weight in lead of the volume of tire removed per 0·5 in. of the tire circumference, and is calculated into equivalent weight of steel worn off the tire by the formula

$$\frac{\text{Weight of lead (diff.)} \times \text{circ. of tire in inches} \times \text{sp. gr. steel}}{\text{width of test piece} \times \text{sp. gr. lead}} = \text{Weight of tire loss.}$$

The tread portions of the shoes only are used, the flanges being removed in order to prevent uneven readings due to side pressure or wedging of the wheel flange in the groove of the shoe; the wearing face of the wheel is flat, the shoe bearing upon the centre portion only.

Particulars of Test Apparatus and Conditions.—Wheel tire, 33 in. diam. × 3¼ in. wide, made from Siemens open-hearth acid steel, test piece from a tire of the same cast giving 56 tons maximum stress, 14 per cent. elongation in 2 in.

Motor.—30-H.P. series traction. Equivalent speeds during tests, 10 miles per hour.

Weight on Shoe. Wet Test.—Adjusted to give a pull on the shoe equal to one fourth of the retarding force required to balance the acceleration due to gravity of a four-wheel, 10-ton car, descending a 1 in 9 gradient at a speed of 10 miles per hour. If applied to the car on the level, this would be equal to a retardation at the rate of 3·6 ft. per sec. per sec., and would stop the car at 10 miles per hour in 4·09 seconds in a distance of 30 ft. neglecting any retardation due to the friction of the car or other forces.

Weight on Shoe. Dry Test.—One half of that used in the wet test, this lesser weight was used in order to allow a long run to be made without the temperature of tire or shoe rising sufficiently to effect the coefficient of friction.

Duration of Tests.—Wet tests, 4 to 5 hours.
Dry „ 2 hours.

During the wet tests the lower portion of the tire was run into a trough of water, a stream of cold water impinging upon its surface near the shoe, the trough having an overflow for maintaining the water at a constant level.

Dynamometer.—Spring type, non-recording.

Readings taken at ten minutes intervals and averaged.

It may be noted here that the steadiness or otherwise of the dynamometer index varied with the amount of tire wear; in the case of small wear it was steady during the whole run, but with a large amount of tire wear the vibrations of the index were so violent that it was most difficult to obtain readings, screechings with very heavy wear being continuous and decidedly unpleasant.

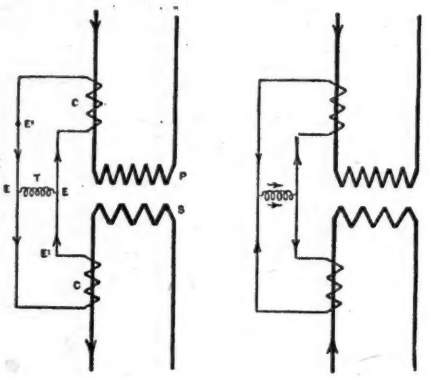
(To be continued.)

Municipal Transfer to Company.—The Town Council of Konigsberg, Prussia, proposes to transfer the municipal electricity works and tramways to the A.E.G. on a lease. It appears that the tramways, notwithstanding various absorptions of other lines, have always been worked at a loss, although the idea of leasing them would probably not have occurred if the Siemens-Schuckert Works in the first place, and the A.E.G. in the second, had not made offers to take over the undertakings, as each contemplated the erection of a large station at Konigsberg, and desired some foundation to work upon. During the course of time the negotiations with the Siemens-Schuckert Works collapsed, but those with the A.E.G. were continued and have led to a provisional arrangement for taking over the two undertakings. The A.E.G., which will form a subsidiary company to carry on the work, will pay to the town for the lease an annual sum of £57,500.

THE B.T.-H. SYSTEM OF TRANSFORMER PROTECTION.

In providing switchgear for the control of transformers banked in parallel, it has long been recognised that the use of protective devices operating on overloads is accompanied by two serious disadvantages. They are as follows :—

1. If one transformer fails, those in parallel are often disconnected, as they have to provide not only the load current but that



Figs. 1 and 2.

required to operate the automatics on the secondary side of the faulty transformer. This results in failure of supply.

2. The transformers are liable to be disconnected by a momentary heavy overload or fault, which might have cleared itself, or been cleared by automatics on the distributing system. This also results in a general failure of supply.

It is customary to deal with these difficulties by the use of some form of reverse-current device on the secondary side, and by the use of delaying devices on the overload automatics on the primary side. Neither device fully meets the requirements. The operation of reverse relays is dependent on the maintenance of a certain minimum potential, say from 10 per cent. to 50 per cent. of normal potential according to the type, thus on a heavy fault these devices

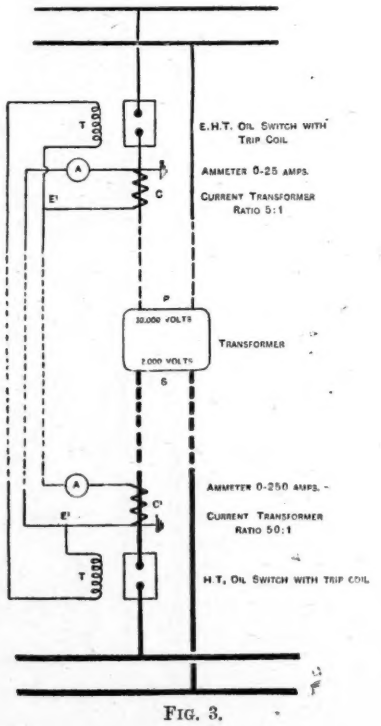


Fig. 3.

sometimes fail. Moreover, they may be operated by a momentary surge of energy pumped back through the transformers on a heavy fault occurring elsewhere on the primary system, and temporarily depressing the primary voltage. Several types of reverse relay have been known to fail on heavy forward current.

The use of delaying devices on the overload automatics, results in increased disturbance of the system should a transformer breakdown.

A simple system introduced by the B.T.-H. Co., is free from these defects, and has now given satisfactory service for several years on some of the largest power distribution plants, as well as on certain smaller installations where maintenance of supply is of primary importance.

The principle is illustrated by fig. 1, in which the primary and secondary windings of one transformer are shown. Current transformers are installed on both sides with their secondary windings coupled in series. The ratio of transformation of the two current

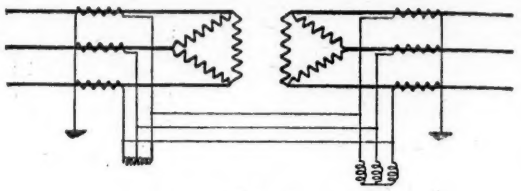


Fig. 4.

transformers is proportioned to that of the main transformer, so that their secondary currents are equal, and this current normally circulates between the two transformers. A trip coil or coils, or a relay, is connected in shunt to the two secondaries as indicated, but carries no current under normal conditions.

If now the transformer breaks down internally, the ratio of input to output will be altered, and the current transformers will no longer give equal secondary currents. A difference current corresponding to the fault current will now flow through the tripping device and actuate the automatic switches to disconnect the transformer.

It will be seen that the tripping device carries the algebraic difference of the currents corresponding to the input and output, so that if the secondary current reverses, the difference current is increased still further. See fig. 2.

The device is unaffected by forward current, or by a reverse surge passing through the transformer, thus the transformer will be held up to its work unless and until it fails internally. The arrangement is also independent of potential fluctuations.

Care must be taken to connect the tripping device across points of equipotential in the secondary circuit, otherwise it will be operated on

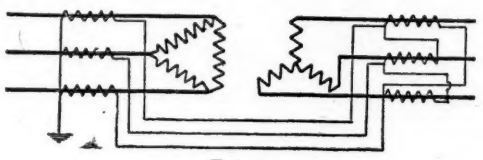


Fig. 5.

heavy loads. Except, however, where the pilot wires coupling the secondaries are of unusual length, or a very sensitive tripping device is employed, any convenient points may be chosen for the connection.

In fig. 3 the complete connections are shown for a single-phase transformer equipment. It will be seen that the current transformers employed to excite the usual instruments, are employed also to operate the protective device, and that the desired results are obtained without the use of relays or auxiliary supply for tripping purposes. The secondary winding of each current transformer is solidly earthed.

In fig. 4 are shown the connections for a three-phase transformer, with both sides connected in delta. The same connections would be employed for a star transformation. Alternative methods of

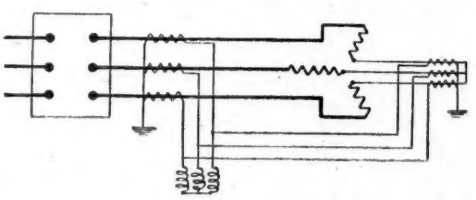


Fig. 6.

connecting the trip coils are shown, that at x requiring only two coils, whilst that at y gives equal current settings on all three phases.

Where the main transformer is connected star delta, the current transformers must be similarly connected as in fig. 5.

Protection against overloads may be obtained in a very simple manner, by inserting a B.T.-H. patent time-limit fuse in the secondary winding of one of the transformers. On a continued predetermined overload this fuse will blow, and by disconnecting the corresponding current transformer will force the current to enter the tripping device. Whilst this fuse has an inherent time characteristic which will be effective on overloads, this does not prevent the instantaneous operation of the tripping device on a fault occurring in the transformer.

An interesting phenomenon has been observed on switching in transformers protected in this manner. When a transformer is switched out by means of an oil switch, the current is suddenly broken at or about zero value when the flux is near its maximum value, thus the transformer may be left highly magnetised in a

particular direction, and owing to the closed magnetic circuit this flux is retained. If now on switching the transformer into service the voltage applied at the first moment be such as to demand an increase of flux in the same direction as that remaining in the iron, the flux density will be carried to saturation point, and an abnormally large magnetising current will be required until the cycle of magnetism settles down to the normal condition. This magnetising current is all input, and therefore appears in the shunt circuit as a spurious fault current, and if sensitive tripping devices are employed, will cause the disconnection of the transformer. In such cases the tripping device may be shunted by a B.T.-H. patent time-limit fuse to delay its operation.

The above system is capable of other applications. For example, it may be applied to a generator, as in fig. 6. In this case, the generator will be disconnected with certainty in case of breakdown of the H.T. windings, but will not be disconnected under any other conditions. It will be noted that the cable connections to the alternator are included in the protective system.

LEGAL.

Road Repair Arbitration.

(Concluded from page 528.)

The arbitration proceedings were continued at Exeter, in the case in which St. Thomas Rural District Council are suing Messrs. Siemens Bros. to recover £1,650 damages for injury to roads consequent on the laying of cables for the Post Office between Taunton and Exeter.

The reply on behalf of the defendants is that they have done no excessive damage to the roads, that the roads were in a very bad state before the cables were laid, and that the cable traffic was not such as to injure any properly constructed roads.

The Arbitrator proceeded to take the case of the Tiverton Rural District Council against the same contractors in respect of the alleged damage to roads in the execution of the same contract.

Mr. Randolph said it was agreed at the trial that the verdict in the St. Thomas case should govern this one. The point was how much they were to have of their claim on this particular piece of road. The extraordinary expenditure was estimated at £120 per mile for a total length of 10½ miles.

On Friday Mr. Ricketts, on behalf of Messrs. Siemens, contended that the case had not been properly proved. The needs of the neighbourhood might apply possibly to small district roads; but, when they came to a trunk road leading to the capital city of one county and also to the capital city of the next county, it was quite another matter. It must be known to the Council, even if it had not been proved in the documents brought before them, that the motor traffic was increasing.

Mr. Randolph, on behalf of the Council, remarked that he did not suppose the arbitrator would give all the claim; at the same time, he did not think he would consider it was a dishonest claim.

The Arbitrator will present his report in due course.

Justus Eck *v.* Union-Castle Mail Steamship Co., Ltd.

An interesting case in which Mr. Justus Eck, of the Union Electric Co., Ltd., was plaintiff, and the Union-Castle Mail Steamship Co., Ltd., were the defendants, was heard at the City of London Court last week, by Judge Rentoul. Plaintiff and his wife and daughter went to Cape Town in August, 1909, travelling first class by one of defendants' boats, and they returned in December, paying £56 for accommodation. After being at sea for some days, one of the cabins could not be occupied any longer owing to complete absence of ventilation. On behalf of plaintiff, it was stated that in the company's booklet they claimed to have a complete system of ventilation throughout, and electricity was brought to bear on the cabins, saloons, &c., by the use of electric fans. A further £4 12s. 2d. had to be paid to enable Mrs. Eck to occupy a suitable cabin, and Mr. Eck claimed for the return of this amount, and contended that the company had been guilty of a breach of contract and misrepresentation. For the defendants, it was stated that they did not guarantee that every cabin would have an electric fan in it.

Judge Rentoul, in giving his decision, said he thought that anybody reading the booklet would think that the cabins had electric fans in them, and Mrs. Eck's cabin had not. If there had been a fan in her cabin, no matter how badly ventilated it was, the company would not have been liable. If fans had been provided, and they had gone wrong, there would have been no case. He must, in the circumstances, find for Mr. Eck, with costs.

He refused leave to appeal.

Germany.—The Deutsche Pope Lampen Gesellschaft is the title of a new company which has lately been formed at Aix-la-Chapelle, with a capital of £35,000, to manufacture electric lamps in accordance with the Pope patents.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

SALVADOR.—Any person who may ship articles of commerce to Salvador, even although such articles may be exempt from duties or taxes, must draw up an invoice in quadruplicate of all the goods constituting his shipment to each consignee. These invoices are to be made out in Spanish, and must state (*a*) the name and residence of the shipper, the port of shipment, the name of the vessel and of the master thereof, its destination, the name of the consignee, except in cases where goods are shipped to order, and the name of the person on whose order or account they are shipped; (*b*) the marks on the packages; (*c*) the serial number of each package shown separately, but should various packages be of the same weight and also contain the same goods, one entry may suffice; (*d*) the kind of package (sack, case, bale or barrel, &c.); (*e*) the gross weight of each package in kilogrammes expressed in letters and figures, except in the case of machinery, lumber and iron, of which the total weight only need be given; but if, as in the case of the exception noted in (*c*), the weights and contents of the packages are identical and they are invoiced on one line, then the weight of one package may be shown in letters and figures, and the total weight shown in figures in a separate column; (*f*) the name of the merchandise contained in each package according to the nomenclature of the Tariff, and the material of which the merchandise is made; (*g*) a detailed specification of the contents of each package—*i.e.*, weights and measures, value, place of origin, &c.; (*i*) the total value of each package in the currency of the country whence shipped, and the total value of the lot if there are several packages of the same goods. Invoices, with the exception of those for unpacked iron, lumber and machinery, may refer to two or more packages entered under the same mark or number. The following declaration must be made at the foot of invoices:—"I, the undersigned ....., make oath and say on my honour that the foregoing invoice consists of ..... sheets, and relates to ..... packages, weighing together gross ..... kilogrammes, and represents a value of ..... (in the currency of the country whence the goods originate); that the marks on and number of each package, weight, contents and quoted price thereof correctly refer to the packages shipped by me, and agree with the entries in my books, and that the goods have been insured for a sum of ....." This declaration will be certified by the Consul of Salvador at the place of shipment, and the following fees will be payable:—

Invoices not exceeding £5 value	4s.
" " " £20 "	8s.
" " " £100 "	16s.
" " " £200 "	24s.
Invoices exceeding £200, for every £20 or part of £20 up to £1,000	1s.
Invoices exceeding £1,000, for every £20 or part of £20 ...	5d.

The Customs authorities are not allowed to proceed to the clearance of goods if the person concerned has failed to produce the certified invoice.

The duties payable are given below, and, in addition to these duties, the following surtaxes are levied on all goods paying duty:—

	Pesos (gold) per 100 kg.
For the judicial power	·46
Central Railway bonds	·89
Importation and exportation bonds	·92
Subsidy of steamers...	·23
For the public revenues (levied in silver) ...	1·38
On behalf of almshouses	30% of the total duty payable.
Further surtax	2·40

Exemption from the tax of 1·38 pesos per 100 kg. and the further surtax of 2·40 pesos is allowed on goods marked below with an asterisk, and all goods which are admitted free under the ordinary tariff are likewise exempt from all the above surtaxes.

Duties are levied in American gold—*i.e.*, peso = 4s.; but the following rates, having been calculated in silver, must be reduced in the proportion of 22 to 10 before calculating gold for payment.

	Pesos per kg.
Leather belting and packing for machinery	·01
Steel wire, unclassified	·30
Scientific instruments, not specified	Free.
*Posts, columns, props, lightning rods, pumps, cables of iron, steel or brass wire	·01
Machinery of all kinds for manufacturing purposes, motors with any kind of power magnets	Free.
Copper, brass or bronze wire	·40
Asphaltum...	·02
Tar, liquid or solid	Free.
Articles for lighting: lamps, chandeliers, lanterns, &c., of metal, glass, crystal or porcelain, with all their accessories, such as founts, holders, brackets, arcs, burners, wicks, chimneys, globes, screens, shades and reflectors, whether of glass, porcelain, or ordinary metal	·25
N.B.—Lamp shades and screens not specified are dutiable according to the component material.	
Asbestos for machinery	·01
Pitch	·05
Rubber belting and packing for machinery	·01
Celluloid, manufactured	·60

	Pesos per kg.
Rubber, manufactured, except hose, clothing, &c.	·60
Graphite or plumbago in powder	·10
Telephones, electric bells, &c., and parts thereof	·30
Electrical machines, small	·30
Litharge	·02
Mica in powder or sheets	·05
Mining apparatus, including pumps, motors, pulleys, winches, capstans, &c.	Free.
Lightning rods of copper and their accessories	·01
Galvanised-iron wire for telegraphs and telephones	·10
Machinery, heavy, of all kinds not specified	Free.
Porcelain in articles not specified	·12
*Articles, apparatus, tools and materials, not specified, for telegraphs, electric light, &c.	·01
Electric ventilating fans...	·30
Engines for all kinds of machinery, and all unenumerated articles in which spirit is used as fuel or motive power...	Free.
Accessories of machines when imported in quantities necessary to commence operations	Free.
Accessories of machines imported afterwards...	Dutiable as component material.

NEW PATENTS APPLIED FOR, 1910.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

21,546. "Electrical and gas light device for holding and shading lamps to light stairways and steps in public places of entertainment." Provincial Cinematograph Theatres, Ltd. September 16th.

21,700. "Improvements in the art of telephony." A. Nemeth. September 19th. (Complete.)

21,740. "Improvements in incandescence electric lamps." C. Carangelo. (Date applied for under Sec. 91 of the Act, September 18th, 1909, being date of application in France.) September 19th. (Complete.)

21,775. "Improvements in attachments for telephone instruments for hygienic and other purposes." T. Birkett and G. Cooper. September 20th.

21,784. "Means for, and methods of, limiting the flow of current on a short circuit." A. M. Taylor. September 20th.

21,804. "Improvements in and relating to homopolar electrical generators and motors." R. H. Barbour. September 20th.

21,805. "Improvements in and relating to electrical brushes or collectors." R. H. Barbour. September 20th.

21,848. "Improvements in electrical heating radiators." J. H. Cunnington. September 20th. (Complete.)

21,850. "Improvements in metal-filament electric lamps." H. C. Gover. September 20th.

21,914. "Improvements in electric battery lamps." A. E. Mundy. September 21st.

21,922. "Improvements relating to secondary batteries." D. P. Dunne. September 21st.

21,943. "Improvements in or relating to switches for use with electrical heating and other apparatus." A. F. Berry. September 21st.

21,982. "Improvements in and connected with electric tramcars." S. Gleaves, R. Dearman and E. Shorrock. September 22nd.

22,013. "Improvements in telephone exchange circuits." Siemens and Halske Akt. Ges. (Date applied for under Sec. 91 of the Act, January 29th, 1910, being date of application in Germany.) September 22nd. (Complete.)

22,040. "Contact breaker for magneto-electric sparking apparatus for internal combustion engines." Firm of Unterberg & Helmle. (Application for Patent of Addition to No. 4,030 of 1909. Date applied for under Sec. 91 of the Act, October 11th, 1909, being date of application in Germany.) September 22nd. (Complete.)

22,056. "Improvements in sparking plugs." C. Slater and J. T. Sutcliffe. September 23rd.

22,110. "Improvements in the Ward-Leonard systems for electric motors." Siemens Bros Dynamo Works, Ltd. (Siemens-Schuckertwerke, G.m.b.H. Germany.) September 23rd. (Complete.)

22,115. "Appliance for the prevention of the transmission of infectious or contagious diseases through telephone transmitters, more especially telephone receivers." W. Rozycki. September 23rd.

22,139. "Improvements in or connected with electrical fuse boxes." J. H. P. Burchett. September 23rd.

22,143. "Improvements in and relating to telephonic and telegraphic means of communication, whether wired or wireless." J. R. W. Brown and W. G. H. Montpenny. September 23rd.

22,152. "Electric clock for transmitting time to secondary dials." F. C. Woolley. September 24th.

22,156. "Improvements in inductive wireless telephone installations." H. von Kramer. September 24th.

22,163. "Improvements in electrical switches." J. H. Tucker. September 24th.

22,164. "Improvements in detectors for use in wireless telegraphy and telephony." J. C. Smith and T. H. Lyon. September 24th.

22,174. "Improvements in and connected with means for lighting the interiors of buildings by incandescent electric lamps." A. E. A. Edwards and W. Shaw (trading as Edwards & Shaw). September 24th.

22,198. "Improvements in governors for electric circuits." E. Presser and Gesellschaft fur Elektrotechnische Industrie m.b.H. Septemcer 24th. (Complete.)

22,204. "Improved process for the manufacture of sheets, bands, wire and the like of electrolytic iron." Langbein-Pfanhauser-Werke Akt.-Ges. (Date applied for under Sec. 91 of the Act, September 28th, 1909, being date of application in Germany.) September 24th. (Complete.)

22,224. "Improved methods of determining the presence and direction of the equalising currents in alternating-current apparatus." Siemens Bros. and Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) September 24th. (Complete.)

Fire.—A fire occurred a few days ago at the premises of the Electric and General Supply Stores Co., of 102 and 104, Albion Street, Leeds.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1909.

Separation of Substances by the Wet Magnetic Process. W. E. Lake. (Fried. Krupp Akt.-Ges. Grusonwerk.) 17,453. July 7th.

Lighting of Gas-Burners. M. Delage and P. Woog. 17,486. July 27th. (Request under Sec. 19 of the Act not granted.)

Electrical Means for Securing the Safe Starting of Motor-Cars and the like. W. J. Brooks. 19,747. August 28th.

Apparatus for Electro-Plating. S. O. Cowper-Coles. 20,037. September 1st.

Means for the Production of Long Continuous Electric Arcs. J. Y. Johnson. (Badische Anilin & Soda Fabrik.) 20,129. September 2nd.

Wireless Telegraph Transmitting and Receiving Stations. G. Marconi and Marconi's Wireless Telegraph Co 20,230. September 3rd.

Electro-Thermal Garments for Therapeutic Purposes. B. A. Charles. 20,408. September 6th.

Means to be Employed in the Production of Long Stable Electric Arcs. J. Y. Johnson. (Badische Anilin & Soda Fabrik.) 23,715. October 5th.

Apparatus for Receiving Messages by Wireless Telegraphy or Telephony. British Radio-Telegraph and Telephone Co. and J. G. Balsillie. 24,338. October 23rd.

Installations of Electric Incandescent Lamps Connected in Series. E. Booth and N. R. Booth. 25,288. October 30th.

Intercommunication Telephone Systems and Apparatus therefor. J. A. Romer. 28,461. December 6th.

Electric Conduit Systems. R. Hirst and M. Taylor. 29,953. December 22nd.

1910.

Magneto Generators. C. A. Allison. (L. V. W. Noyes.) 14,315. June 14th.

Vapour Electric Apparatus. E. Podszus. 14,857. June 20th (Date applied for under International Convention, October 17th, 1908. Originally included in No. 22,827 of 1909.)

Voltage Regulation of Dynamo-Electric Machines. Siemens Bros. Dynamo Works, Ltd. (Siemens-Schuckertwerke Ges.) 3,915. February 17th.

Rotary Contact-Breakers for Magnetos for Dual-Ignition Systems. Firm of Weckerlein and R. Stöcker. 6,033. March 8th. (Date applied for under International Convention, April 20th, 1909.)

Support for Incandescence Filaments in Electric Glow-Lamps. Wolfram Lampen Akt.-Ges. 6,397. March 14th. (Date applied for under International Convention, March 15th, 1909.)

Three-Phase Current Arc Lamp. E. Könecke. 6,868. March 18th. (Date applied for under International Convention, March 19th, 1909.)

Starting-Switches for Polyphase Alternating-Current Induction Motors. Adams Manufacturing Co. (Cutler-Hammer Manufacturing Co.) 7,318. March 23rd.

Change-Over Switches for Electric Lighting and other Systems for Railway Carriages and other Vehicles. J. Stone & Co. and A. H. Darker. 7,469. March 24th. (Post-dated October 27th, 1909. Originally included in No. 7,425 of 1909.)

Cut-Outs or Circuit-Breakers for Overhead Electric Conductors. R. Novak. 7,799. March 30th.

Electric Switches. A. P. Lundberg, G. C. Lundberg and P. A. Lundberg. 8,418. April 7th.

Prepayment Electricity Meters. Chamberlain & Hookham, Ltd., and W. S. Sprague. 8,922. April 13th. (Patent of Addition to No. 3,230 of 1910.)

Electrical Signalling Apparatus. C. Snow and J. E. Radley. 9,124. April 15th.

Protecting Devices or Conduits for Underground Electric Cables. R. Ettlinger and S. Ettlinger. 10,054. April 25th.

Armature Windings of Dynamo Electric Machines. Siemens Bros. Dynamo Works, Ltd., and B. G. Pickering. 11,896. May 13th.

Automatic Telegraph Transmitters. L. M. Potts. 15,123. June 23rd. (Date applied for under Rule 13, June 29th, 1909.)

The Crystal Palace Exhibition of 1911.—We have received a copy of the prospectus of the Festival of Empire Imperial Exhibition and Pageant of London, which is to be held at the Crystal Palace next year, from May to October, under Government patronage, and the entire profits of which are to go to King Edward VII Hospital Fund. There is to be an "All British" Exhibition in the existing buildings of the Palace. Next year being Coronation year, London is expected to be thronged, and this exhibition is likely to be a centre of great attraction. Among the features in preparation is mentioned an electric railway 1½ miles in length with stations at the respective Dominion Buildings; there will be 10 trains of full-sized cars giving a 2-minutes service. The prospectus gives some particulars as to the classification of exhibits, including sections for mining, engineering and shipping, also transportation and motive power. Communications should be addressed to the Exhibition Space Secretary, at the offices, 81, Piccadilly, London, W.

Turbine Contracts.—It is announced from Zurich that Messrs. Escher, Wyss & Co. have just received a repeat order from the Sao Paulo Tramway, Light and Power Co., of New York, for hydraulic turbines. The order comprises four turbines, which, at a speed of 180 r.p.m., are each able to yield 4,500 h.p., or a total of 18,000 h.p. When these turbines, which are to be direct-coupled to dynamos with horizontal shafts, have been installed, the central station will have a total output of 35,000 h.p., as it is already equipped with four turbines of about the same size, which were supplied by the same Swiss company in 1904. In addition, the latter company has on order from the Western Canada Power Co., of Montreal, two turbines of a similar kind, for an output of 13,000 h.p. each, at the Stave Lake station, and a 10,000-h.p. turbine for the Shawinigan Water and Power Co., of Montreal.